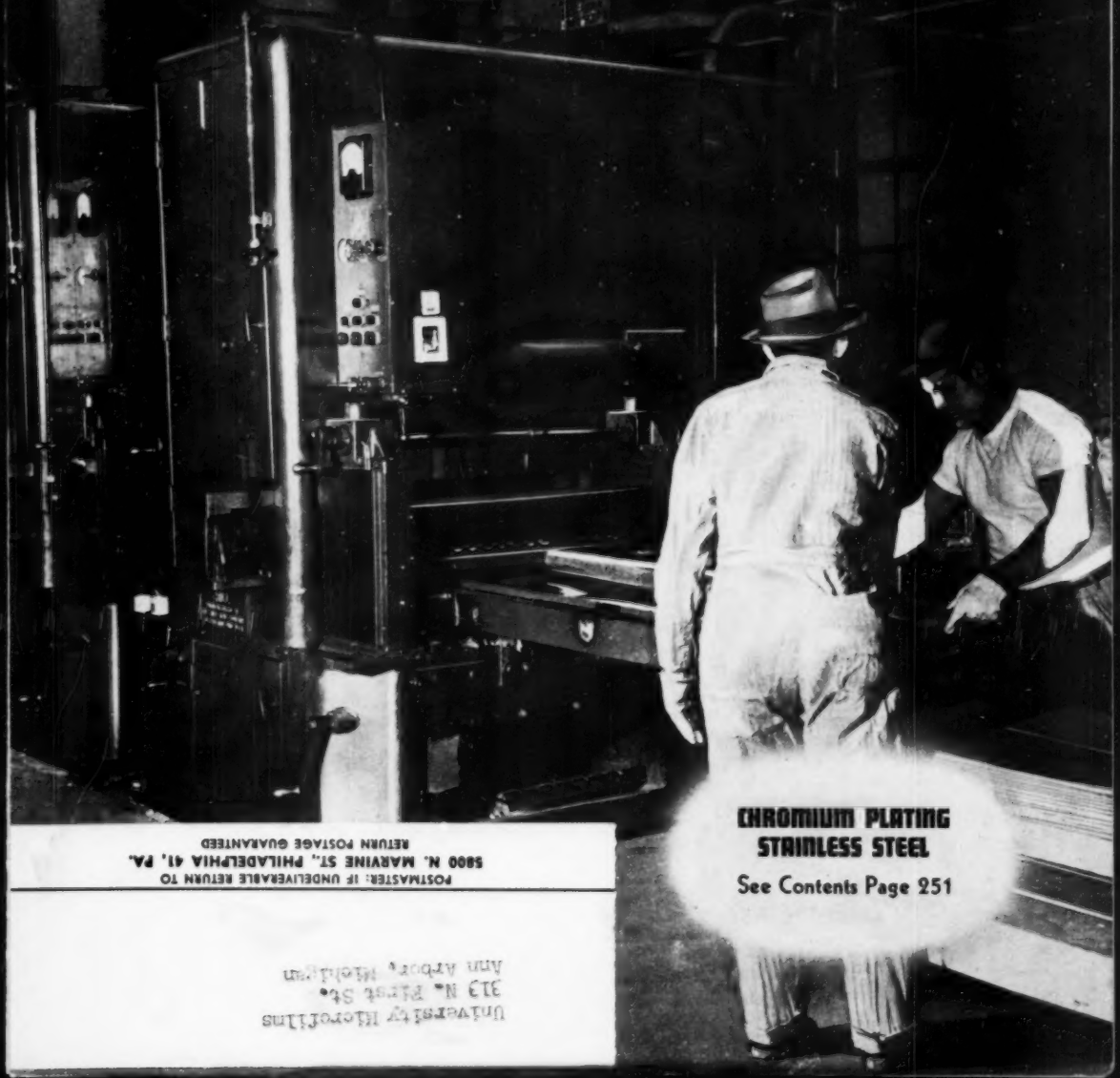
VOLUME 37
NUMBER 3

MARCH, 1950

plating



CHROMIUM PLATING STAINLESS STEEL

See Contents Page 251

POSTMASTER: IF UNDELIVERABLE RETURN TO
5800 N. MARVINE ST., PHILADELPHIA 41, PA.
RETURN POSTAGE GUARANTEED

University Microfilms
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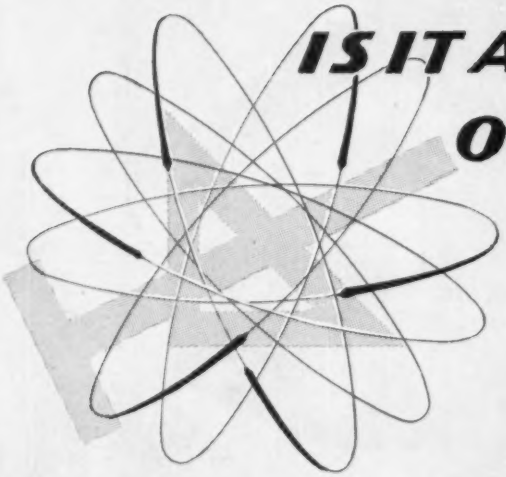
Ann Arbor, Michigan

BALL BURNISHING



IS IT A SCIENCE OR AN ART?

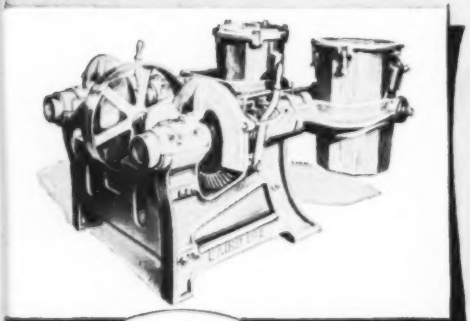
WE feel that this question is answered on page 14-16 of our New Clepo Barrel Finishing Manual. With the information given in this booklet we believe we have removed all of the experimental art from ball burnishing and have put ball burnishing on a sound practical operating basis.

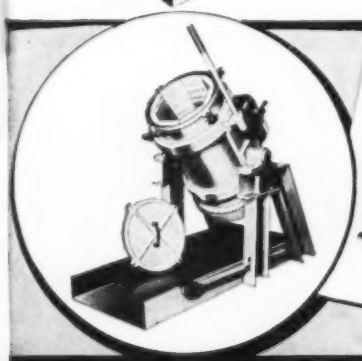
The following subjects are covered in detail in our new booklet:

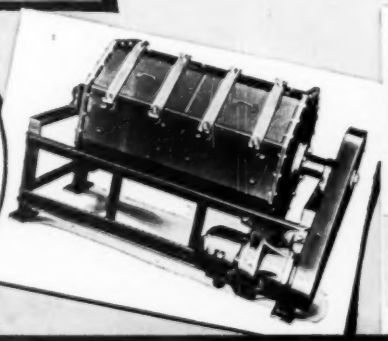
Types of Burnishing Mediums,
Care of Burnishing Mediums,
Barrel Types and Barrel Speed,
Preparation of work for Burnishing,
Types of Burnishing Compounds.

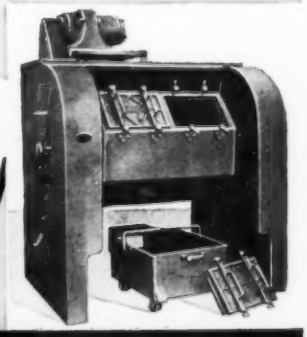
•

A request on your Company Letterhead will bring a copy of the new Clepo Barrel Finishing Manual to you immediately.









FREDERICK GUMM Chemical Company Inc.

538 FOREST STREET, KEARNY, N. J.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 151.

Ne[illegible]ations

...AL FINISHING...

METAL STRIPPER — A

An outstanding development for stripping defective electroplated nickel, copper, silver, cadmium and zinc from steel. Fast action . . . no basis metal attack. The highly polished grill cover illustrated has been completely stripped of nickelplate, and is *ready for replating without repolishing.*

EBONOL BLACKENING PROCESSES

Ebonol finishes are used to beautify a widely diversified list of superior quality products. Photo shows steel parts blackened with Ebonol-S and S-30; copper and brass with Ebonol-C; zinc with Ebonol-Z. U. S. Patents — 2,364,993, 2,460,896, 2,460,898.

EMULSION CLEANER — 75

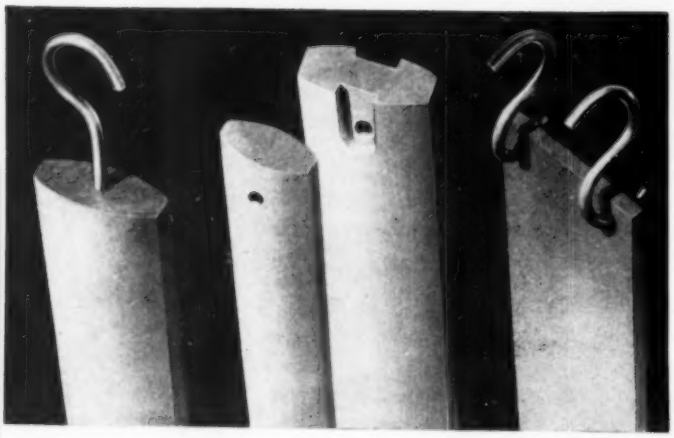
Oils, greases, buffing compounds, solid particles, deep seated in steel parts are cleaned out and completely removed by this emulsification process. Stubborn, gummy substances on die castings, milling machines, floors, motor blocks emulsify and disperse in water instantly.

ENAMEL STRIPPERS

Enthone has over 20 strippers for removing organic finishes — synthetic enamels, lacquers, vinyls, japans. The best strippers, tailor-made for your particular problem, are selected by laboratory technicians after test runs. This service is rendered free of charge.

Enthone Incorporated

ANACONDA
means purity in copper anodes



WHEN you specify ANACONDA, you are assured of unexcelled purity . . . less than 0.01 percent of total metallic impurities . . . an advantage that pays off five ways:

1. *Copper goes into solution faster and more uniformly.*
2. *The highest quality deposit is produced in the shortest possible time.*
3. *Slime is reduced to an absolute minimum.*
4. *Spotting and discoloration of the deposit are minimized.*
5. *Scrap losses are exceptionally low.*

In addition to copper, ANACONDA Anodes are furnished in brass and bronze . . . rolled sheet or oval . . . cut to your own specifications or standard sizes . . . drilled or undrilled . . . with or without hooks—also copper "cathode-anodes". For present or future reference, write for Publication C-5, The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

for Plating with Copper, Brass or Bronze

Use ANACONDA Anodes

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A 153.

Industry News

Turco Products, Inc. celebrated its greatest sales year at its 23rd management conference held recently in Los Angeles.

The company, which started as a three-man organization in 1927, now manufactures over 200 industrial and platers' cleaning compounds in five plants—in Los Angeles, Houston, Chicago, and McCook, Ill.—and distributes them through 10 regional sales branches. Research and controll aboratories are in Los Angeles.

At the conference dinner meeting a special citation was given to George J. Scherrer, Manager of the Southern California Sales District, for the best sales record during 1949.

New Production of Chromic Acid. Better Finishes and Coatings, Inc., Newark 5, N. J., is now shipping Chromic Acid Flake, Technical Grade, produced in newly installed electrochemical equipment in its Newark plant. Analyses by independent testing laboratories indicate that the new product is lower in chlorides, sulfate and insolubles than required by U. S. Government Specification AN-A-21.

New field service representatives of the Metal Industries Department, The Diversey Corporation, Chicago. From left: Frank E. Smith, B. B. Bulton (sales training instructor and former promotional manager), D. F. Seymour (sales training instructor), W. R. Swift and C. L. Hodgins (Diversey Corporation of Canada, Ltd.)

Enamelling Movie. "White Magic", a 30-minute, 16-mm sound movie in color, showing the latest techniques in the production, use, and spray application of "Dulux" white enamel for home appliances, has been released by E. I. duPont de Nemours & Company, Finishes Division, Wilmington, Del.

The film was made on the production lines of nationally known manufacturers as well as in duPont plants in Toledo, Ohio, and Chicago, Ill. Besides telling the story of how high quality finishes are made and applied, it indicates how savings may be effected and the finish im-

Published monthly at 5800 N. Marvine St., Philadelphia 41, Pa. Entered as second class matter July 1, 1946, at the Post Office at Philadelphia, Pa., under Act of August 24, 1916. Copyright, 1950, by the American Electroplaters' Society, Inc. Subscriptions: Domestic and Canada $4.00 per year, 50c per copy; Foreign, $6.00 per year, 75c per copy.

• FOR HIGH PRODUCTION POLISHING AND BUFFING •

ROTARY AUTOMATICS • SEMI-AUTOMATICS • STRAIGHT LINE AUTOMATICS

ACME ROTARIES

★ . . . put many types of parts on a low cost production basis!

ACME Automatic Rotary Polishing and Buffing machines meet the exacting requirements of a great many production polishing and buffing operations. Acme Rotaries range from small 18-inch units to large machines 22 feet in diameter. They are built in both continuous and indexing types and with a variety of arrangements to handle parts of many different shapes and sizes, including round and out of round.

ACME Rotaries are cutting finishing costs on work as small as screw heads and as large as automobile bumpers. They have proved their efficiency on job after job for many years . . . where production demands uniform quality finish at low cost.

These dependable machines are engineered and built to maintain high production and conserve high cost man-hours. For nearly half a century many of the nation's leading industrial plants have found that ACME Automatic Polishing and Buffing machines help keep costs down . . . and profits up.

★ *Save high cost man-hours—with low cost* ACME *machine-hours*

SPECIAL MACHINERY AMC AUTOMATIC BUFFING MACHINES

ACME Manufacturing Co.

1645 HOWARD ST. DETROIT 16, MICH.

Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR OVER 30 YEARS

A *NEW* ADDITION To The Cowles Line Of Metal Cleaners

Cowles HD

HEAVY DUTY SOAK TANK CLEANER

Cowles H D Cleaner is a new, high pH, heavy-duty soak tank cleaner designed for removal of particularly stubborn soils and grease from steel parts and castings. In formulating H D Cleaner, the twin objectives of efficiency and economy were effectively achieved.

For greater customer convenience, Cowles H D Cleaner is packed in Leverpak drums, 400 lbs. net.

Prompt shipments from convenient warehouse stocks.

COWLES TECHNICAL SERVICE
gladly furnished on request.

Cowles Chemical Company

METAL CLEANER DEPARTMENT • CLEVELAND 3, OHIO

Nature Shares a Cleaning Miracle with

AHCOLOID EMULSION CLEANER

For a quick miraculous cleaning, toss a soiled handkerchief into the hot bubbling springs of Yellowstone Park. You can depend on it, the waters will return it to you spotless and undamaged.

But dependable *speed, thoroughness,* and *safety in cleaning* is no monopoly of these natural earth-heated springs. In cleansing the oily surfaces of industrial metals, AHCOLOID EMULSION CLEANER works small cleaning "miracles" every day. Its routine job is the penetrating and loosening of clinging oils, enabling a quick water rinse to wash away the film. AHCOLOID EMULSION CLEANER is noncorrosive and gives off *no* malignant toxic fumes in operation — it is completely safe.

The special properties of AHCOLOID EMULSION CLEANER assure rapid, thorough, safe performance.

Send for a free copy of this booklet, "AHCOLOID EMULSION CLEANER", which explains in detail the properties and operation of this remarkable new cleansing agent.

Over 101 Years of Service

APOTHECARIES HALL CO.
WATERBURY 88, CONN.

Please send me a free copy of your new booklet, "Ahcoloid Emulsion Cleaner".

NAME _____

COMPANY _____

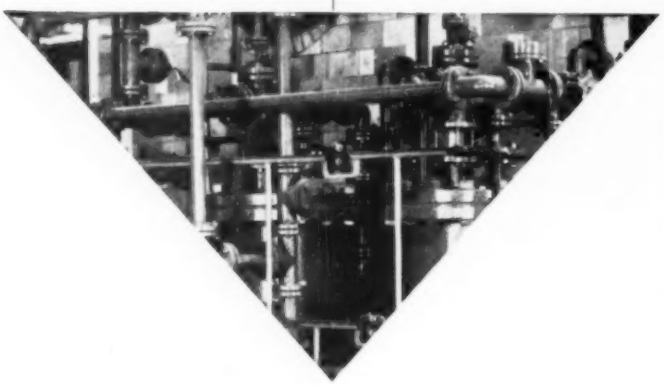
STREET _____

CITY or TOWN _____ STATE _____

SARAN LINED

steel pipe

cuts repairs and replacements to a minimum!



The conveyance of corrosive liquids can prove as hard on profits as it is on equipment. It's this realization that has compelled more plants than ever before to install corrosion-resistant saran lined steel pipe. Saran's resistance to most chemicals and solvents reduces shutdowns and lost production! Saves time and labor!

Saran lined steel pipe is available in maximum lengths of 10 feet and in sizes from 1 to 6 inches inclusive. Also available are saran lined diaphragm valves, plug valves, flanges, reducing flanges, flanged fittings, gaskets and fittings with union ends.

Write us today for further information concerning saran lined steel pipe and how it may help solve your corrosion problems. Manufactured by The Dow Chemical Company, Bay City, Michigan, distributed by Saran Lined Pipe Company, Dept. TSP-14.

Distributed by

Saran Lined Pipe Company

701 STEPHENSON BUILDING • DETROIT, MICHIGAN

Offices in: New York • Boston • Philadelphia • Pittsburgh
Chicago • Tulsa • Indianapolis • Houston • San Francisco
Los Angeles • Portland • Cleveland • Denver • Seattle
Charleston, S. C. • Toronto

SARAN LINED PIPE a DOW product

Industry News

proved by proper spraying technique. Showings to interested parties may be arranged by writing to the address above.

Sam B. Crooks has been appointed West Coast representative of **The Matchless Metal Polish Company** and its subsidiary, **Advance Polishing Wheels, Inc.** Long associated with the finishing industry, Mr. Crooks will supply engineering service. In the very near future he will carry adequate stocks of Matchless polishing and buffing compounds and all types of buffs. His address is 1401 Santa Fe Avenue, Los Angeles 21, Calif.

Metalwash Machinery Corporation, formerly of 149 Shaw Avenue, Irvington, N. J., announces the opening of its new plant on U. S. Route 1 at 901 North Avenue, Elizabeth 14, N. J.

This new plant, located on a 4½-acre tract, is alongside Newark Airport convenient to the Newark railroad stations and easily accessible by automobile.

The manufacturing area of more than 30,000 square feet is served by traveling cranes with capacities up to 35 tons, as well as railroad sidings. New machinery has been installed to provide better and more economical manufacture of washing machines, dryers, pickling machines, and special machinery.

The plant has a two-story air-conditioned office building containing executive offices, as well as purchasing, sales, engineering, and accounting departments.

"Lektron" Trade Mark Registered. Electronic Rectifiers, Inc., Indianapolis, Ind., has announced the registration of the trade mark, "Lektron" for its line of magnesium-copper sulfide dry-disc rectifiers. "Lektron" rectifiers use magnesium radiator plates to reduce weight and give improved heat dissipation.

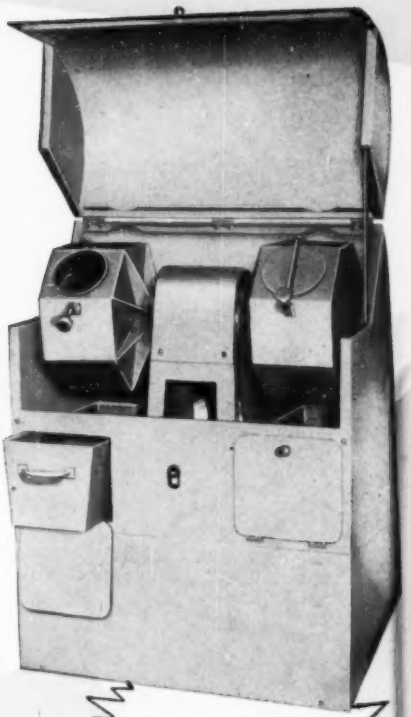
Allied Research Buys Hoffman Chemical. As part of an expansion program to increase the company's line of metal finishing chemicals, Allied Research Products, Inc., Baltimore, Md., has purchased the R. A. Hoffman Chemical Company, Cleveland.

R. A. Hoffman, formerly owner of the Hoffman Company, has joined Allied Research and will be in charge of the development of new types of organic finishes. The Hoffman research laboratory in Cleveland will be transferred to Baltimore when new laboratories have been completed at the Allied Research plant.

New in Precision Barrel Finishing

ALMCO Supersheen MODEL DBO-1

FOR A BETTER FINISH FASTER ON SMALL PRODUCTION RUNS



The *newest* addition to America's Most Versatile Line of Precision Barrel Finishing Equipment. Ideal for small shops, small production runs, experimental processing. All welded steel construction. Sturdily built to take it! Easily loaded and *mechanical* unloading and separating mean *lower* operating costs. *Removable* watertight drawers with drain plugs eliminate need of drainage facilities. Safety hood and chain guard assure *maximum* safety.

It's the last word in compactness, advanced precision barrel design. Write today, Dept. PL-3 for full DBO-1 details.

ONLY $490.00 F.O.B. Albert Lea, Minn.
PROMPT DELIVERY

Cuts Costs up to 90%

Free Engineering Clinics

Eight *strategically* located SUPERSHEEN Engineering Clinics have been established to provide you with *quicker* and *better* sample processing—and to keep you *fully* informed of the latest developments in precision barrel finishing. These are YOUR clinics to use *without obligation*. Bring us your problems and actual parts for sample processing and complete production cost data—OR you may send parts for sample processing if it is not convenient to personally visit the Clinic nearest you.

The SUPERSHEEN line consists of (1) Advanced Design *Precision* Deburring and Finishing Barrels in sizes from 8" x 16" up to 60" x 30". (2) *Automatic* loading, unloading and separating equipment. (3) A *vastly* superior grinding and finishing medium in two grades and 9 sizes.

The SUPERSHEEN Process can be applied to produce the *precise* result in a *wider* range of work—from *fast* deburring to the *gentle* honing of stampings, castings, forgings and machined parts . . . even where micro tolerances are a must! The "before and after" photo at left is unretouched.

ALMCO Supersheen

DIVISION OF QUEEN STOVE WORKS, INC.
FACTORY AND GENERAL OFFICES ALBERT LEA, MINNESOTA

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 156.

Federated ANODES

for the Plating Trade

COPPER Anodes . . . M-Sterling Chilled-cast in flat, oval, wedge, and ball shapes. Open mold shapes also available. All of prime electrolytic copper.

LEAD Anodes . . . the M-Sterling Dated Conducta-Core Anode with specially designed strong hooks coated to protect against acid fumes and spray.

TIN Anodes . . . flat and oval shapes . . . all standard sizes . . . made only of extra high purity tin.

ZINC Anodes . . . only of Special High Grade zinc in all standard sizes and shapes.

BRASS Anodes . . . full range of analyses . . . flat, oval, wedge, and ball shapes.

Federated Anodes are sold through offices in 22 principal cities. Quality is continuously controlled by Federated metallurgists so that you get anodes free of gates, flash, and cavities . . . anodes of high chemical purity . . . so that you get uniform plating performance.

Federated first in the non ferrous field FMD

Write, wire, or phone for complete information

Federated Metals Division

American Smelting and Refining Company, 120 Broadway, New York 5, New York

STRETCH YOUR CADMIUM

ASK THE PLATER WHO IS USING IT! He'll Tell You That ROHCO 20XL CADMIUM BRIGHTENER:

1. GIVES UNBELIEVABLE UNIFORMITY OF DEPOSIT THICKNESS. This improvement means that LESS CADMIUM is used to meet minimum thickness specifications.
2. GIVES UNEQUALED BRILLIANCE OF DEPOSIT OVER THE WIDEST BRIGHT CURRENT DENSITY PLATING RANGE. This means freedom from burning combined with bright recesses.
3. PROVIDES MAXIMUM PRODUCTION FROM BARREL UNITS—because ROHCO 20XL Barrel Solutions may be operated at unusually high temperature (up to 105° F.) thus minimizing cooling difficulties. ROHCO 20XL Barrel Solutions provide unusually high conductivity because they may contain up to 4 oz. per gallon caustic soda, thus giving maximum current and production.
4. IS VERY EASY TO CONTROL—because it has an unusually wide latitude of operable concentration range. Conversion to ROHCO 20XL does not require extra treatment or entail delay in production.
5. IS ECONOMICAL TO USE—for the reason that it costs 2% or less of the metal used. This cost, many times, is less than the cadmium and labor saved through improved throwing power, higher production and reduced rejects.
6. IS AVAILABLE IN EITHER POWDER OR LIQUID FORM, AS DESIRED.

ROHCO

ROHCO PRODUCTS
NO-CRO-MIST • HULL CELL TEST • ROHCO 20XL CADMIUM BRIGHTENER ROHCO BARREL ZINC BRIGHTENER • RINSE-AID • CRÖMETER

R. O. HULL & CO., INC.
1277 West 3rd Street
Cleveland 13, Ohio

Canada: Armalite Company, Ltd.
Toronto 6, Canada

"YOUR PLATING IS BEST WITH THE HULL CELL TEST"

GET THE FACTS!!!

JUST PIN THIS COUPON TO YOUR LETTERHEAD

R. O. HULL & CO., Inc.
1277 West 3rd Street
Cleveland 13, Ohio

Gentlemen:
Send complete details and ROHCO 20XL Production Plated SAMPLE!

Name ..... Title .....
Company .....
Address .....
City & State .....

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 160.

Controlled Oxidation Pentrate

is Blacker

THE NEW CONTROLLED OXIDATION PENTRATE FOR RAPID, ECONOMICAL BLACK OXIDE FINISHING OF STEEL.

This new method and product is 25 to 50% faster acting and costs less.

The new C.O.* Pentrate is unique, trouble-free, and easy to operate.

Steel parts are finished a dense jet black in solutions that are under control at all times and operate at peak efficiency.

Controlled oxidation was designed to meet all black oxidizing requirements for single and double bath operations.

A BRAND-NEW PRODUCT!

Easy, Fast, Lower Costs

C.O.* Pentrate is a development resulting from 25 years' experience in black oxide finishing.

Heatbath Corporation introduced black oxide finishing in 1925. Since then it has marketed more black oxide finishes than all others combined.

Write for Data Sheets describing the new Controlled Oxidation Pentrate.

HEATBATH CORPORATION

SPRINGFIELD 1, MASS.

In Canada: Wm. J. Michaud Co., Ltd., Montreal, Quebec

Fill in Coupon and mail today!

HEATBATH CORPORATION P-2
Springfield 1, Mass.

Please send me new data sheets on Controlled Oxidation Pentrate.

Name.....

Position.....

Firm.....

Address.....

* *Controlled Oxidation.*

Industry News

Cowles New Research Laboratory. The laboratory of the Cowles Chemical Company, Cleveland, Ohio, recently moved to greatly enlarged quarters at 105 S. Townsend Street in downtown Syracuse, N. Y., is of fireproof construction having a reinforced concrete floor, brick walls, and sheetrock ceiling. Main aisles run along each outside wall of the building, with Kewaunee metal work tables placed perpendicular to them, so that there is complete access on all sides.

The laboratory benches consist of double tables, 16 feet long, with sinks at one end of each. Hoods of the baffle type, six feet long butt up in pairs against the opposite end of the double work tables. Hot and cold water, gas, compressed air, 110-and 220-volt a-c current are supplied to all work benches. Special equipment, located along the outside walls, includes glass blowing table, low distillation bench, large oven, automatic electric water still, chipped-ice storage chest, and drafting table.

Research projects at Syracuse include development of heavy chemicals in the silicate field and metal cleaners, organic research and engineering of new processes and equipment for the company's three plants. They are conducted by a staff of twenty chemists and engineers under the direction of Dr. C. W. MacMullen.

New Research Laboratory of the Cowles Chemical Company

Plating Department Wins Housekeeping Award. Proof that a plating department can be kept clean is furnished

by this picture in which W. F. Meyers, shift foreman (left), receives the monthly award for good housekeeping in the Goodyear Aircraft plant, Akron, Ohio. A number of the department members watched the ceremony.

Charles F. L'Hommedieu & Sons Company, Chicago, Ill., has appointed **John J. Meehan,** 1345 16th Avenue, San Francisco 22, Calif., its representative in the San Francisco area. Mr. Meehan is the Secretary of the San Francisco Branch of the American Electroplaters' Society.

United Chromium, Incorporated has moved its Detroit facilities to a new 17,000 sq.ft. building on 1700 E. Nine Mile Road, Detroit 20. It houses a research laboratory, pilot plant, offices, and warehouse.

SPARKLER
horizontal plate
FILTERS

SPARKLER horizontal plate FILTERS

Good Plating Requires Clean Plating Solutions

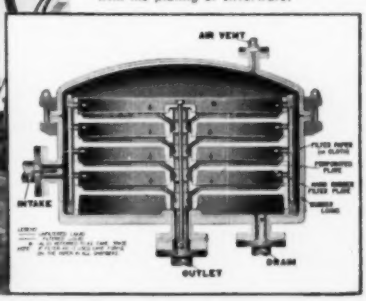
Sparkler Horizontal Plate Filters effectively remove all solids and precipitates from plating solutions—provide positive assurance that solutions are free from undesirable matter.

The horizontal plate principle used by Sparkler makes possible the formation of firm, stable filter cakes that will not slip or crack under intermittent or continuous flow. Flow through the filter is always *with* gravity, and filter aid is floated into position, forming a firm cake of even thickness.

The accompanying photograph shows a typical Sparkler installation in a modern plating plant. Previously, in this plant, silver chloride slurry was shoveled into crocks and laboriously washed by decantation. Now, chloride is mechanically agitated, collected, and washed in the Sparkler filter. Cost of the operation has been sharply reduced and quality of the chloride has been greatly improved.

Filters are pressure-tight and leakproof, and are available in rubber-lined construction, stainless steel, or iron. Capacities from 60 to 10,000 G.P.H.

Our Engineering Service is available for your specific problems.



SPARKLER MANUFACTURING CO.
MUNDELEIN, ILLINOIS

This Sparkler Filter is used by a large silverware manufacturer in connection with the plating of silverware.

YES,

Old Fashioned

Methods Cause Delay—and

COST YOU MONEY

SIEFEN

Spray Compounds are Modern as the Future — They Cut Production Costs, Increase Quality, Profits!

Spray composition is fast replacing bar composition because it is faster and more economical! J. J. Siefen, a leader in the field for over 20 years has created the perfect SPRAY COMPOUND for your particular type of buffing or polishing work.

THE Siefen System
SPRAY EQUIPMENT
SPRAY COMPOUNDS
SPRAY SERVICE

Our representative in your territory will be glad to help you in any buffing or polishing problem.

J. J. SIEFEN CO.
5641 LAUDERDALE
DETROIT 9, MICH.

Industry News

The Roto-Finish Company has transferred its operations from Sturgis, Mich., to its new factory at Kalamazoo, Mich., where all manufacturing facilities are available for producing Roto-Finish equipment and supplies.

One feature of the new plant is the sample-processing department which is located in an area 25 by 80 feet. The floor

is built for proper drainage, and all material handling is by an overhanging bridge-crane system which services the complete installation. All models of Roto-Finish equipment and supplies are used here to demonstrate Roto-Finish Processes under conditions as nearly as possible like those met in actual plant operations. This department also has several new experimental machines for the development of improved finishing methods.

A modern experimental laboratory and an engineering department are maintained for the development of new methods and equipment.

Udylite-Stevens Merger. An agreement contemplating the merger of Frederic B. Stevens, Inc., into The Udylite Corporation has been announced by the officers of the two companies. The necessary formal agreements are in course of preparation and will be submitted to the respective boards of directors and stockholders in due course. It is expected that the matter will be submitted to the Udylite stockholders at their annual meeting on April 27.

Frederic B. Stevens, Inc., was founded upwards of sixty-five years ago and for a great many years has been a leading producer of foundry supplies, polishing compounds, and various related products. It operates plants in Detroit, Mich., New Haven, Conn., and Buffalo, N. Y., and, through wholly owned subsidiaries, in Windsor, Ont., and Springfield, Ohio. Frederic B. Stevens, Inc., has offices and warehouses in principal cities and will continue its operations as a division of The Udylite Corporation.

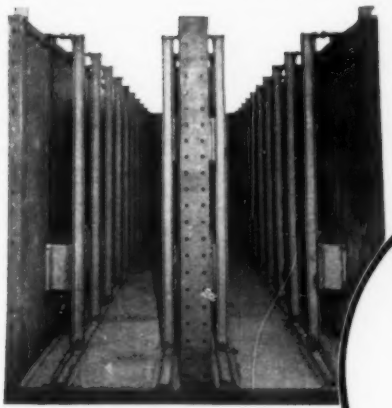
The Udylite Corporation is a leading manufacturer of plating machinery, supplies and equipment, and a producer of automotive parts. While its stock is listed on the New York Stock Exchange, the Stevens shares have been closely held.

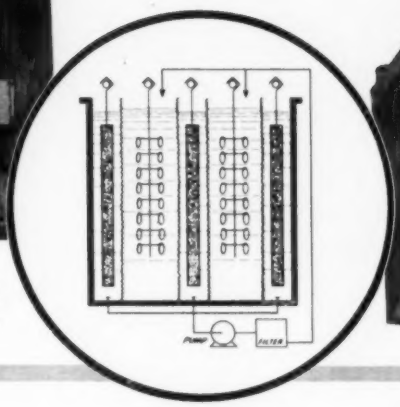
The 1950 Instrument Conference and Exhibit, the fifth sponsored by the Instrument Society of America, will be held in the Memorial Auditorium, Buffalo, N. Y., from September 18–22.

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A 163.

DIAPHRAGMING*

THE KEY TO BETTER PLATING





*Diaphragming eliminates roughness by 100% filtering from the plating solution, insoluble particles generated at the surface of the anode.

ARCO FABRICATES AND RUBBER INSULATES DIAPHRAGM TANKS

Diaphragm Tanks provide for separation of the anode and cathode compartments by means of a canvas diaphragm. This prevents flow to the work piece of insoluble particles.

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ARCO'S experience with this improved plating procedure and better control of insulating materials made possible by our own manufacture of the rubber we use.

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If you'd like complete technical information on these and other burnishing compounds in the complete Wyandotte line, just call your nearest Wyandotte Representative or write direct to:

WYANDOTTE CHEMICALS CORPORATION
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Wyandotte
REG. U. S. PAT. OFF.

Personals

J. T. Murname has been appointed Industrial Sales Manager for Pittsburgh Plate Glass Company's Paint Division at Newark, N. J. Associated with the Division since 1925, he has represented the firm in the Baltimore district until now.

Gloster P. Hevenor is now Executive Vice-President of Aquadyne Corporation, New York City and will be responsible for the Company's dust control activities.

For eighteen years prior to joining Aquadyne Corporation, Mr. Hevenor was with The Johnson-March Corporation, of which he was President 1943-1948. He is a registered Professional Engineer in New York State, Past President of Rochester Engineering Society and Past President of New York State Assembly of the American Association of Engineers.

Robinson

C. B. Robinson, Vice-President of Wyandotte Chemicals Corporation in charge of the J. B. Ford Division, retired on January 25 but will continue to serve as a sales consultant.

He joined the J. B. Ford Company in 1917, working his way up to the presidency of the J. B. Ford Sales Company, in 1929. In 1943, when the company was made a division of Wyandotte, he became vice-president of the parent organization. He is a member of the Detroit Board of Commerce and the Detroit Golf Club.

Cleveland Lane is now Manager of the newly organized Public Relations Division of the Pennsylvania Salt Manufacturing Company. Mr. Lane, who previously served as Pennsalt account executive with Geare-Marston's Public Relations Department, came to Pennsalt from the Home Life Insurance Company in New York where he was Manager of the Field Service Division. Before his four years of war service with the Army, Mr. Lane was associated with the Brush-Moore Newspapers in Ohio.

John C. Hampson, former Indiana field representative for the Pennsylvania Salt Manufacturing Company's Special Chemicals Department, has been named Sales Manager for the department's newly formed Chicago district.

GRINDING WELD from cold-rolled steel lighting fixture rings, using wall mounted backstands with Grit 80 Three-M-ite Cloth Belts.

100% FASTER WELD GRINDING WITH 3M BELTS

Backstand method produces smoother finishes at 43% saving

Smoot-Holman Company at Inglewood, California found that converting from coated set-up wheels to Three-M-ite Abrasive Belts meant a real saving in time and production costs. Their production rate jumped from 37 to 75 pieces per man hour, and grinding costs dropped from 3½ ¢ per unit down to 2¢ per unit.

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FREE BOOKLET shows you actual case histories of how 3M Abrasives have saved thousands of dollars in finishing costs. Volume II is just off the press—33 pages crammed with money-saving ideas. Write for your copy today.

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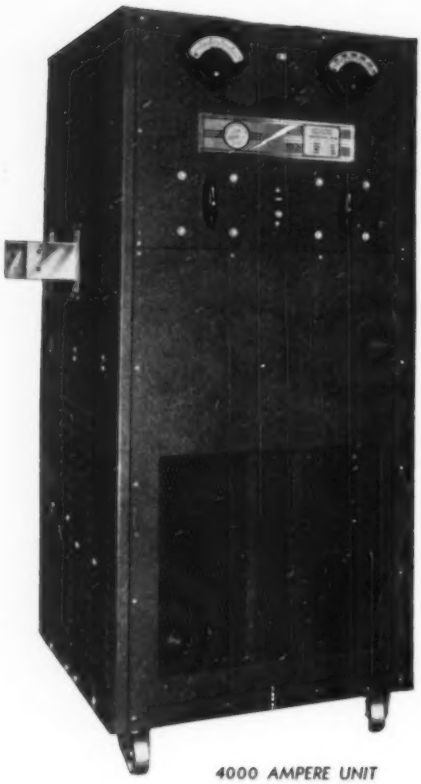
REDUCE PRODUCTION COSTS

. . . by replacing your old generator equipment with the new AC to DC power source described here



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EFFICIENT at 1/4, 3/4 and 1/2 load as well as at full load. Draws only the power needed to plate the work in the tanks.

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WRITE FOR INFORMATION or call for one of our Field Engineers to check your requirements and point out where your production costs may be reduced. No obligation whatever.

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Personals

The new sales district, with offices at 20 N. Wacker Drive, Chicago, will include the present Wisconsin, Illinois, Indiana and Missouri territories.

Mr. Hampson joined Pennsalt in 1936 as a salesman for the B-K and Household Products Department. In January, 1943 he transferred to Special Chemicals and since then has been working out of Indianapolis.

L. K. Lindahl, President of The Udylite Corporation, Detroit, Mich., was recently commissioned "Admiral of the Flagship Fleet", an honorary organization sponsored by American Airlines.

Presentation of a certificate signifying his appointment was made by Brigadier General L. G. Fritz, Vice-President in Charge of Operation, American Airlines. The ceremony took place following a luncheon at Detroit's Recess Club in Mr. Lindahl's honor.

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TOP FLIGHT MANUFACTURING AGENTS AND JOBBERS Wanted in certain territories to sell Schaffner's Buffing Compositions and Supplies. We specialize in White Finish (Lime, Compositions), Grease Stick, Tripoli, Emery Cake, etc., in "Bar or Liquid Form". All up to 100 per cent saponifiable. These items can all be made to fit your particular customers' requirements. No account is too small or too large for our individual attention.

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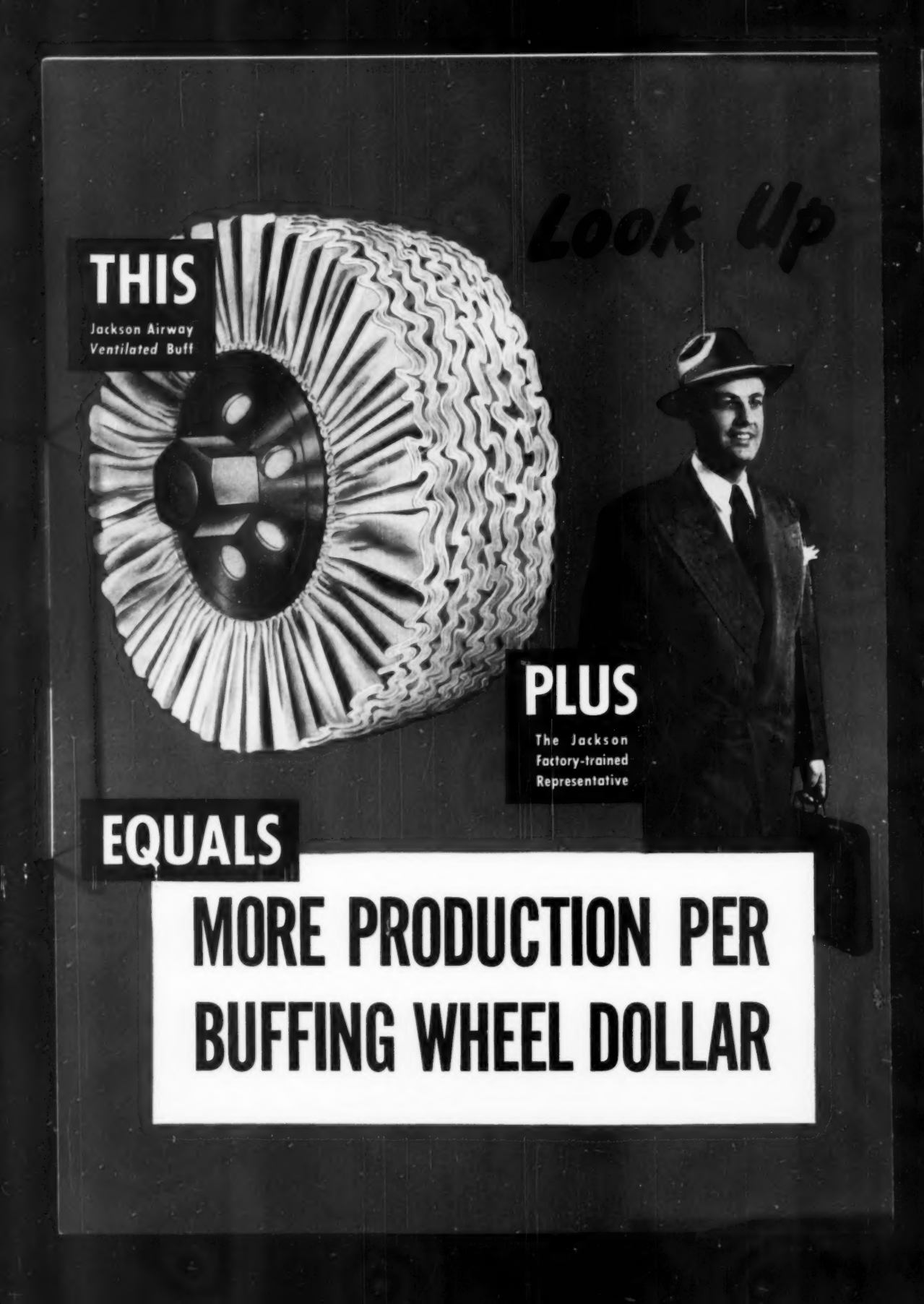
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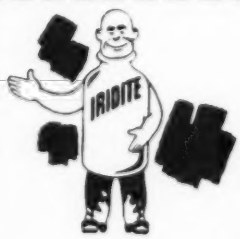

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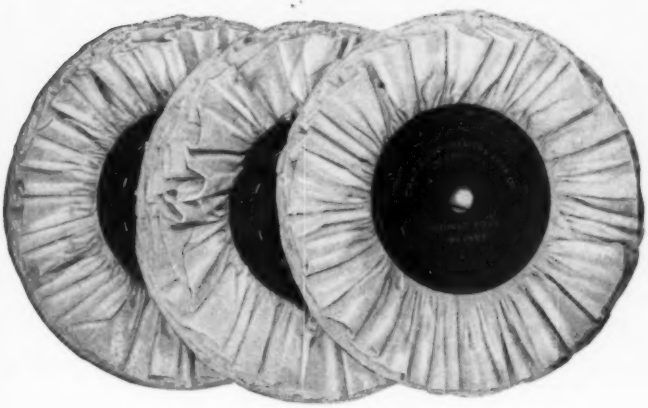

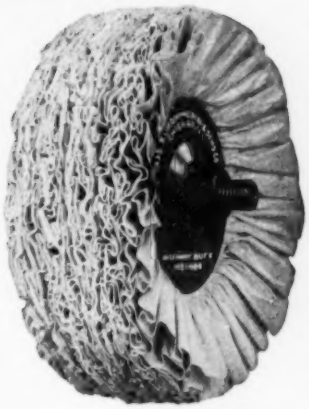

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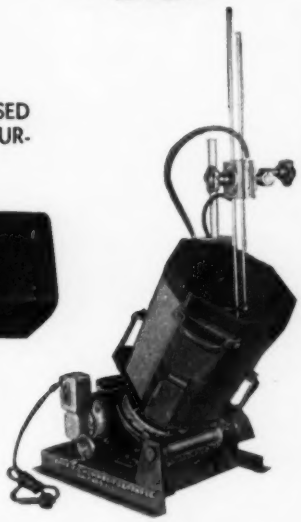

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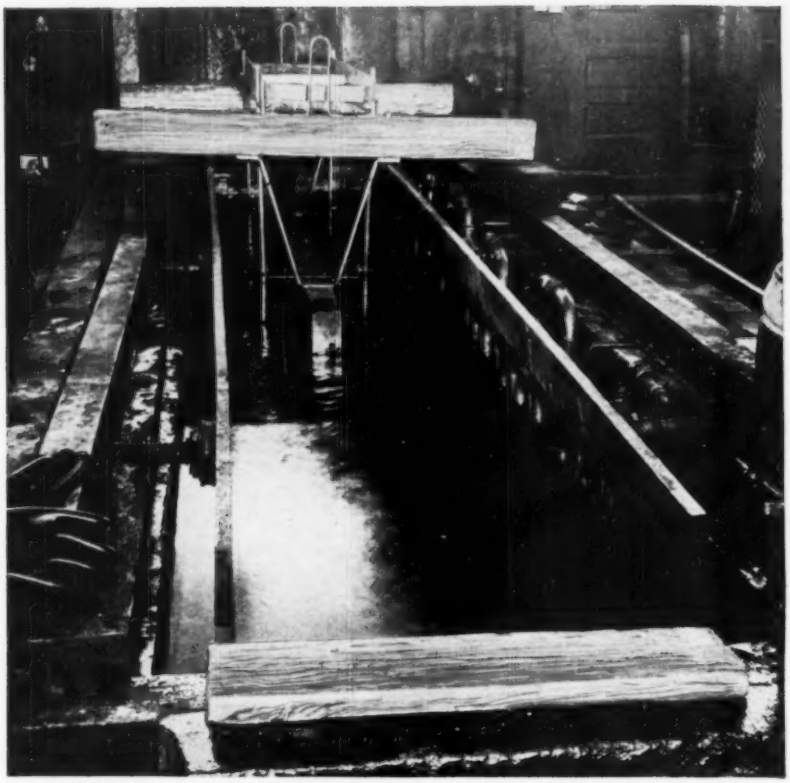

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NALCO METAL can be used in both hard and decorative chromium plating plants.

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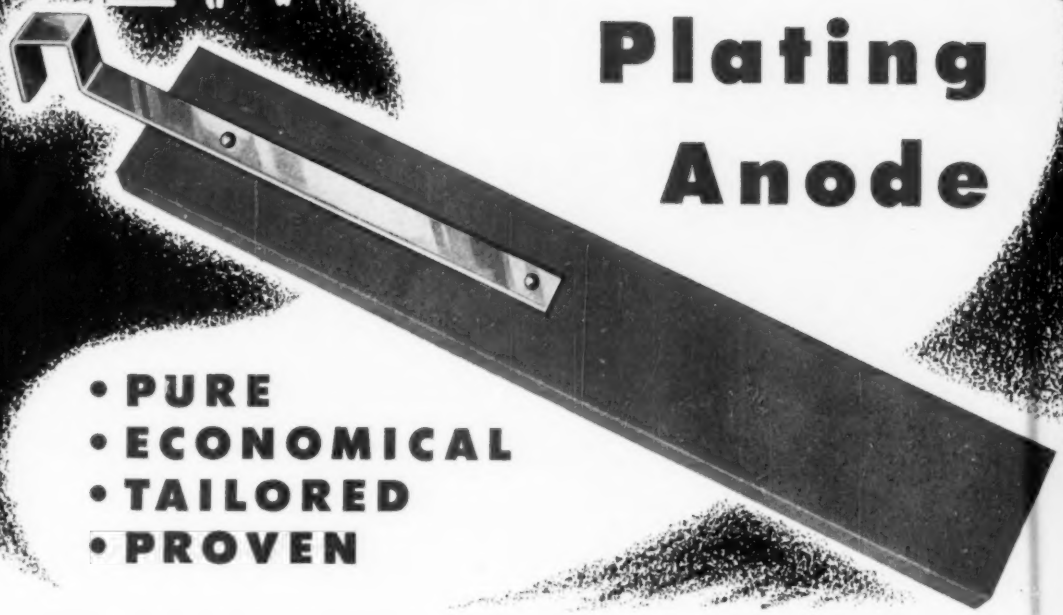

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- Quality is constant—99.98% *pure* electrolytic copper.
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- You may have any length or width to fit various tank sizes or work, tailored to your order, standard thickness approximately ½".
- Standard sizes are available to fit conventional anode bags.
- Long steel hook outlasts the copper, reducing danger of breakage of anode near surface.
- Efficiency is proven. Many leading plating plants and departments have already changed over to LECTROCOP electrolytically deposited anodes.
- Fabrication is immediate, in our Detroit plant. No long shipping delays.

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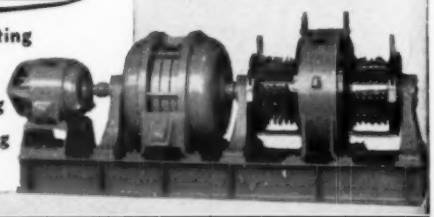

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Trade Literature

L—356. Electroplating Course—Joseph B. Kushner, Electroplating Engineer, Stroudsburg, Pa., offers a folder, "Electroplating Know How", which describes his course under the same name and offers testimonials from satisfied students. For your copy, use Reader Service Card.

L—357. Paint Spraying Unit—Savings up to 40 per cent in labor and material costs of spraying paint and other finishing materials are claimed for the use of the Graco Paintmaster, manufactured by Gray Company, Inc., 40 Eleventh Avenue, N. E., Minneapolis 13, Minn.

This air-operated unit, a positive-displacement immersion-type paint-supply gear pump and agitator, delivers a full supply of paint directly from original containers to the spray head at fluid pressures lower than are now commonly used. For this reason "overspray" losses are cut sharply. Since no air pressure is exerted upon the paint itself, aeration is reduced to a negligible amount, thereby eliminating bubbles and pin holes in the finished surface.

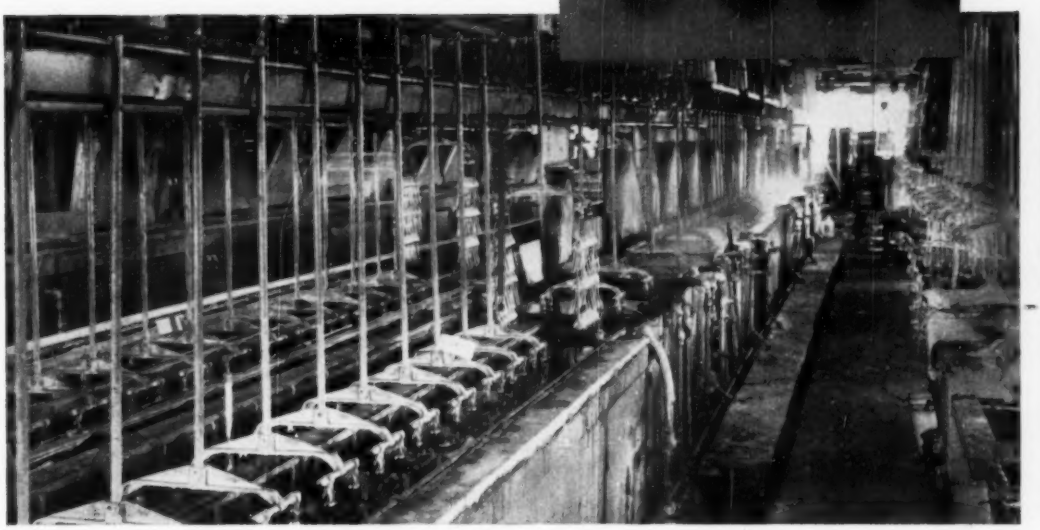
Two sizes are available, a portable 5-gal model for production and maintenance painting and a 55-gal model for pumping to the spray head or functioning as the supply source for a circulating paint.

For your copy of an 8-page illustrated bulletin describing the units, use Reader Service Card.

L—358. Spectrophotometry—Reliable spectrophotometric data should now be more easily obtained with the aid of a new 48-page booklet, "Spectrophotometry", recently issued by the National Bureau of Standards as its Circular 484.

The techniques and data resulting from the Bureau's extensive experience in spectrophotometry are presented in this guide so that users of spectrophotometer can better understand their instruments, calibrate and maintain them in proper operating condition, and guard against the numerous errors common in such work. Instruments and methods for use in the ultraviolet, visible, and near-infrared spectral regions are considered, including photographic, visual and photoelectric methods. Important topics covered include definitions of spectrophotometric terms, essential parts of spectrophotometers, typical instruments in current use,

For more than 10 years Oneida Ltd. of *Community* plate fame has consistently used Pennsalt Cleaners



The silverware plants of Oneida Ltd. have used Pennsalt Cleaners for more than a decade in the manufacture of Community, Heirloom Sterling, Tudor Plate and 1881® Rogers® Silverplate. Pennsalt Cleaners have proved successful in the multi-step process of removing buffing compounds prior to silver plating. The task is especially difficult because of the filigree and embossing of intricate and deeply sculptured ornamentation.

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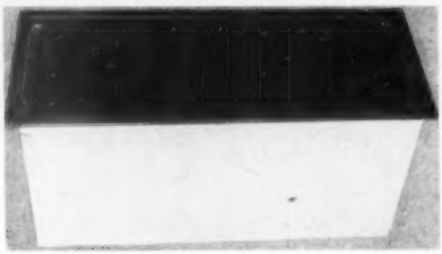

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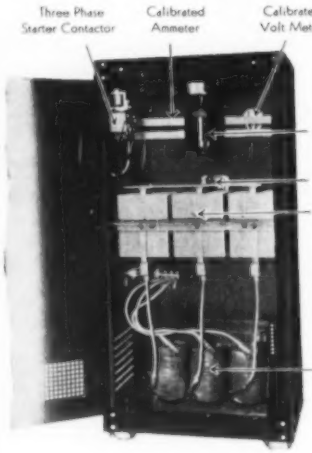
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Trade Literature

types of errors which usually occur in spectrophotometric work, and presentation of standard data for checking the calibration of spectrophotometers. In addition, a bibliography of 127 related references is given.

It is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 25 cents a copy. Remittances from foreign countries must be in United States exchange and must include an additional sum of one-third the publication price to cover costs of mailing.

L—359. Corrosion Resistant Cement—A new chart showing the resistance of both resin and silicate cements to 259 corrosive chemicals has just been issued by the Special Chemicals Department, The Pennsylvania Salt Manufacturing Company, 1000 Widener Building, Philadelphia 7, Pa.

The chart is believed to be the most complete listing of its kind and is based on tests conducted by Pennsalt. For your copy, use Reader Service Card.

L—360. Paint Spraying Equipment—A new 62-page catalog presenting a complete line of industrial paint-spraying equipment is being mailed free upon request to the M. & E. Manufacturing Company, Indianapolis, Ind.

The applications of all of M. & E.'s industrial painting products are explained in detail in the catalog. A comprehensive price list section is included.

L—361. Phosphate Coatings, Metal Cleaning, Spray Booth Maintenance—A set of reference file folders, announced by Klem Chemicals, Inc., Dearborn, Mich., facilitates filing of technical data under headings of Paint Removal, Phosphate Coatings, Metal Cleaning, and Spray Booth Maintenance.

The cover of each folder provides brief descriptions of the line of compounds and chemicals available from the company. For your copies, use Reader Service Card.

L—362. Selenium Rectifier—Rapid Electric Company, 2847 Middletown Road, Bronx 61, N. Y., has a one-page sheet describing its series of 150-ampere rectifiers with output voltages in the range of 0–12. Some models include variable output controls. All are complete, ready for operation, with ammeter and voltmeter. For your copy, use Reader Service Card.

L—363. Cut-off Machines for Metallurgical (Thickness) Specimens—Buehler, Ltd., 165 W. Wacker Drive, Chicago 1, Ill., has issued a 4-page illustrated bulletin which describes a series of laboratory cut-off machines, including recirculating cooling system.

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Is Now Fabricated With

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The New Lead Alloy
Which Is Especially Durable
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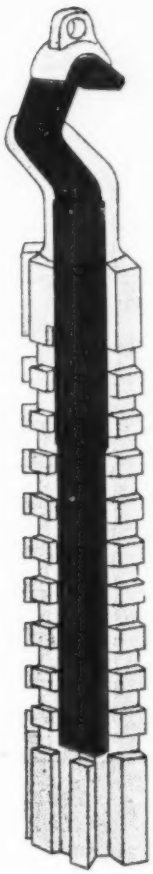

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- **"Copper Core"** and point current construction aids in immediate coverage.

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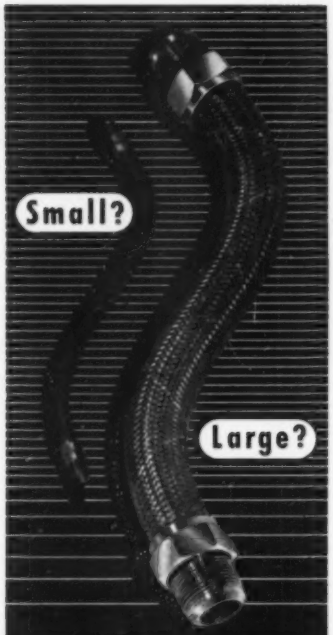

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Trade Literature

L—364. Variable Speed Polishing Lathe—A 4-page illustrated bulletin, "Mitchell Variable Speed Polishing Lathe" issued by Frederic B. Stevens, Incorporated, 1800 18th Street, Detroit 16, Mich., describes and lists specifications for this new series of 3-, 5- and 7-hp lathes. Among construction features are the Roto-Cone variable-speed (1500–3000 rpm) pulley which provides equalized side adjustment on drive shaft with consequent perfect belt alignment; 2-section split spindle joined by heavy-duty flexible coupling for quick belt replacement; 4-bearing shaft suspension for perfect spindle alingment; and instant-action foot brake which cuts out motor on braking of spindle rotation. For your copy, use Reader Service Card.

L—365. Level Control Instruments—A completely new 24-page illustrated Catalog 75 describing the company's line of Levelimeter instruments has just been published by the Fischer & Porter Company. These instruments indicate, measure and control liquid level and inter-face level. Variations in liquid level in weirs and flumes are utilized for measurement and control of large flow rates.

Illustrated and described are magnetic tape-and-drum, electronically transmitting, ball-float, pneumatic and differential-pressure units; V-notch weir and Parshall flume-flowmeter instruments; and chemical-service sight-gauge glasses. Copies may be obtained by writing to the Fischer & Porter Company, 75 County Line Road, Hatboro, Pa.

L—366. Self-priming Corrosion Resistant Centrifugal Pump—An attractive 16-page Bulletin 53 describes and illustrates Type G pumps manufactured by The La Bour Company, Inc., Elkhart, Ind. This vertical-type pump, which is available in a number of sizes, features an impeller with integral hydraulic seal instead of stuffing boxes or mechanical seals which may pass air or liquid. For details of construction obtain your copy by means of Reader Service Card.

L—367. Automatic Polishing and Buffing Machines—By showing the large range of types and installations of automatic polishing and buffing machines, Acme Manufacturing Company, Detroit, Mich., has set out to demonstrate that many types of finishing jobs once thought to be impractical for automatic handling can actually be polished and buffed more economically on automatic equipment. Its new 16-page catalog is a comprehensive presentation of rotary and straight-line automatics set up for various types of applications. For your copy, use Reader Service Card.

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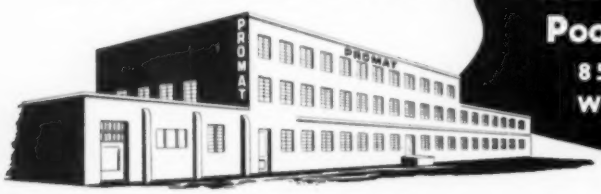

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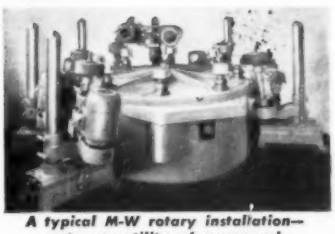
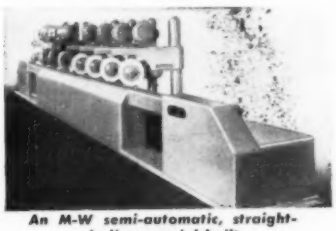


A typical M-W rotary installation—note versatility of compound angle, floating heads.



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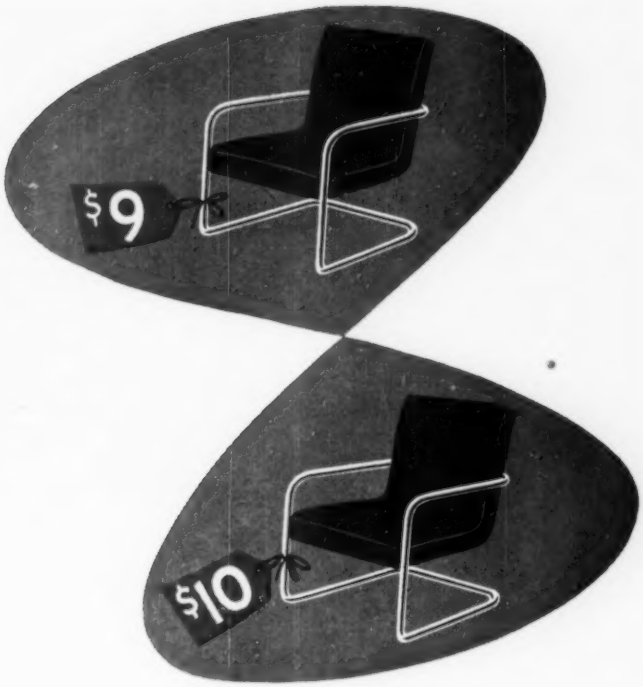

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Only QUALITY PLATING assures repeat business

Pity the poor consumer . . .

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EXPENSIVE to the consumer because he has an unserviceable article which requires replacement, or demands excessive maintenance to keep presentable . . .

EXPENSIVE to the retailer who must rectify the complaint or lose the good will of the consumer . . .

EXPENSIVE to the manufacturer of the low quality item, since he fails to receive repeat orders from the retailer . . .

EXPENSIVE to the manufacturer of the better quality product, because of consumers' inability to distinguish it from an inferior one . . .

EXPENSIVE to all platers, because of the *"black eye"* given to the use of metallic finishes.

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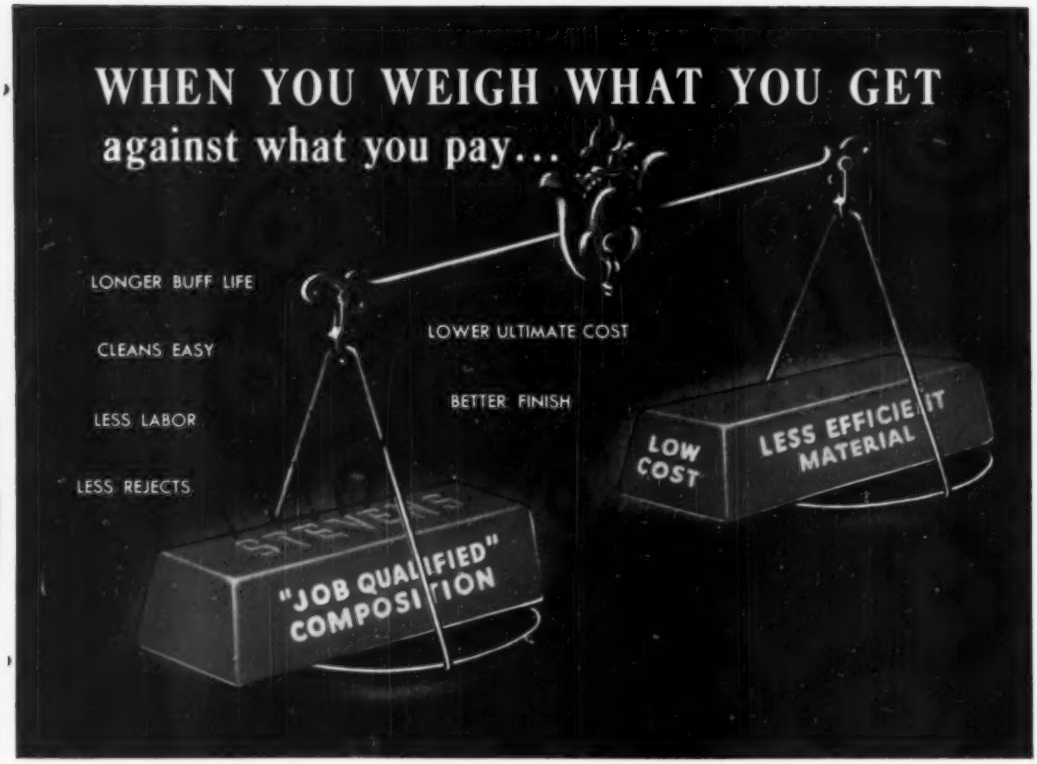

the balance is in favor of Stevens "Job-Qualified" Composition

The cost of buffing and polishing materials is an important factor in metal finishing and it would be wise to remember that very often the use of low-priced material may prove to be expensive in the long run. Savings involved in buying a barrel of "cheaper" composition may very quickly be wiped out by losses due to increased buff wear, rejects, extra cleaning costs, lost man hours—to say nothing of unbalanced output schedules.

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Since it is impossible to production-test every product offered, you are faced by the problem of selecting a buffing or polishing composition that is "Right" for *your* work. At this point, we suggest that you call in a Stevens sales and service representative. He is particularly well qualified to recommend from Stevens' broad range of job-tested, service-proven compositions the one or more specific grades formulated to answer your specific needs. Better finish, easier cleaning, longer buff life, less rejects and increased production are characteristic money-saving advantages of Stevens "job-qualified" compositions.

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Published by: the American Electroplaters' Society. Editorial, Advertising and Executive Offices: 473 York Road, Jenkintown, Pa. Phone: Ogontz 4663. Subscriptions: Domestic and Canada, $4.00 per year, 50c per copy; Foreign, $6.00 per year, 75c per copy.

PLATING is abstracted regularly in Chemical Abstracts, Engineering Index, Technical Data Digest and Bulletin Analytique.

plating

MARCH 1950 VOL. 37 NO. 3

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mind if we blow someone else's horn?

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Editorial

A real fullautomatic

THE PLATER OF TODAY looks with a great deal of pride on the modern fullautomatic plating machine and admires the way it has reduced hand labor in plating. Properly designed and instrumented it not only carries the work through all treatment and plating solutions but also controls several variables such as solution temperature, *p*H, and purity, and means have been suggested for control of overall current density. Truly a wonderful piece of equipment.

But now comes the scientist and says that such a machine is not fully automatic at all. It still requires a plater to think for it: set the controls for what he believes is the best set of conditions, have analyses run and additions made at regular intervals, inspect the parts and make corrections along the line. A real fullautomatic machine, the scientist says, will do all those things itself.

That at least is the implication of an article in the January 23 issue of *Time* magazine entitled "The Thinking Machine". A veritable monster which can be made to work any kind of control devices, it is believed able to operate whole factories. If we understand it correctly, all the machine needs is a mathematical equation which correlates all operating factors that influence the final plate quality—thickness, porosity, appearance, etc.—and two sets of devices, one set which measures the quality factors of the product being plated and another set which changes the operating factors as the brain indicates. The machine would see to it that optimum cleaning, pickling and plating conditions would prevail at all times.

Fantastic, we may say—but apparently quite possible. The only drawbacks seem to be the high cost of the machine, which would limit its use to very large plants, and the tremendous amount of work required to develop the needed equations and to design the control devices.

He who lives long enough will see.

Gustaf Soderberg

ANTIMONY PLATING

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Introduction

Bright deposits of antimony resemble chromium and exhibit similar resistance to tarnish by handling or in the atmosphere. Salt spray tests indicate protection of steel similar to that afforded by nickel-chromium coatings. Antimony is inexpensive and can readily be made available in quantity. Its one great drawback is its extreme brittleness; in cast form it can be shattered easily with a sharp blow.

In this paper the authors report the production of dull to brilliant antimony deposits of any desired thickness from complex citrate baths. The dull and some semibright deposits when subjected to bending appeared adherent and resonably ductile, at least up to 0.001 inch in thickness, and could usually be brought to a very high luster with a light buffing operation. In nearly all cases the fully bright deposits were brittle and highly stressed, but with certain additions almost fully bright deposits were obtained which were not excessively brittle; they were crackfree originally and remained so for three years, as observed under the microscope. While it cannot be said that the production of commercially desirable fully bright antimony deposits has been achieved, the somewhat less lustrous deposits should have value when buffed.

Historical

There are numerous references in the literature to the deposition of antimony. Most of the solutions used fall into one of two classes: halide baths, and complex baths of the organic hydroxycarboxylic acids.

The halide solutions, except the fluoride, suffer from the very great drawback that explosive antimony is frequently deposited from them. Analysis of such coatings[1] from chloride, bromide and iodide solutions shows them to contain considerable amounts of the halogen, and there is evidence[2] that there is actually formed a solid solution of metallic antimony with the metal halide. According to Mellor[3], explosive antimony is formed from solutions containing from 10 to 86 per cent of antimony trichloride when low current densities are used; free acid content or temperature has little influence. Cohen[2] to the contrary states that formation of explosive antimony is promoted by high current density and low temperature. Explosive deposits have likewise been obtained[3] from chloride baths containing sodium chloride or tartrates. Other authors[5] have also discussed the formation of explosive antimony deposits. Mathers and Means[4] studied the effect of a number of addition agents on the character of deposits from a bath containing antimony chloride, ammonium oxalate, and oxalic acid. This study was concerned with very thick deposits only, and while some of the addition agents, notably gum arabic, improved the deposits, all were brittle.

The fluoride solutions of trivalent antimony have two great advantages over the other halide solutions in that they do not hydrolyze to give insoluble basic salts and that the antimony deposit is not explosive. Their use for electrodeposition was proposed as early as 1905 by Betts[6], who obtained smooth, brittle deposits which did not tarnish. Mathers *et al*[7]. tested

simple fluoride solutions containing various addition agents and were able to obtain smooth crystalline deposits 0.2–0.4 inch thick, which cracked when struck, like cast antimony. To the author's knowledge no bright deposits have been reported obtained from these baths.

Many α-hydroxycarboxylic acids, both aliphatic and alicyclic, form complexes with trivalent antimony. The reaction is with the hydroxyl group of the acid,

forming $-C-O-SbO$ or $\begin{matrix} -C-O \\ -C-O \end{matrix}\!\!>\!Sb-OH$

linkages. The partially neutralized acids react better than the free acids, and the optimum degree of neutralization varies with the acid[8].

There are a number of references[4,9] in the literature to deposition of antimony from tartrate baths, with and without the presence of mineral acids. Few of the deposits were of good appearance and most of the brighter deposits peeled on standing. Stout and Goldstein[10] describe the deposition of good quality cadmium-zinc-antimony alloys from a mixed cyanide-tartrate bath at high *p*H, low current density, and low temperature.

A solution containing antimony dissolved in sulfuric acid, an excess of ammonium citrate, and small amounts of other ingredients has been used[11] for the electroanalytic determination of antimony. The deposits were described as bright; when tartrate was substituted for the citrate, the deposit was less bright.

Experimental

Fluoborate Solutions

All attempts to produce antimony fluoborate from Sb_2O_3 or SbF_3 were unsuccessful, resulting in heavy precipitation, and it was concluded that this compound is either insoluble or unstable.

One deposit was obtained from a solution of SbF_3 in a fluoborate medium:

Sb as SbF_3	10 oz/gal (75 g/l)
NH_4BF_4	4 oz/gal (30 g/l)
HBF_4	4 oz/gal (30 g/l)
HBO_3	1 oz/gal (7.5 g/l)
*p*H	less than 1

A satiny, light gray, brittle deposit 0.001 inch (25μ) thick was obtained at room temperature and 5 asf (0.5 amp/dm²) on a steel cathode, using lump antimony anodes. Cathode current efficiency was 100 per cent. No further work was done with this bath, because the fluoride bath had been extensively investigated by Mathers and the presence of the fluoborate ion did not seem to improve the brittle character of the deposit.

Solutions of Miscellaneous Organic Complexes

The solubility of freshly precipitated antimony trioxide in various organic acids and in combinations of the acids and their salts was investigated on a small scale. The following acids did not dissolve appreciable quantities of the antimony oxide: gallic, oxalic, maleic, sulfamic, 2 naphthol 8 sulfonic, 1–3 benzene disulfonic, 1–4 phenol sulfonic, 1–8 dihydroxynaphthalene-3–6–disulfonic, 1–naphthol–4–sulfonic, 1–naphthol–5–sulfonic, β-resorcylic.

Partially neutralized citric, malic, tartaric, or gluconic acids produced soluble complexes, the last-named one only very slowly. Metallic antimony was found to dissolve anodically at very nearly theoretical efficiency in these partially neutralized solutions.

As mentioned above, the character of deposits from tartrate baths as described in the literature was rather discouraging. A few tests with this bath confirmed these reports: the deposits were unsightly, often black and powdery.

A few plates were made from a partially neutralized malic acid bath:

Sb_2O_3	6.7 oz/gal (50 g/l)
Malic acid	18.4 oz/gal (138 g/l)
NaOH	5.3 oz/gal (40 g/l)

Semi bright plates, 0.001 inch (25 μ) thick, with fair ductility were obtained at 15 asf (1.6 amp/dm²) and 70°F (21° C).

Solutions of Citric Acid Complexes

Since citric acid is readily available in quantity, most of the work was done with this sytem, which was investigated rather extensively. Sodium, ammonium, potassium and, to a lesser extent, lithium citrates were used. In the ammonium system, Sb_2O_3 dissolves in triammonium citrate to the extent of 3 equivalents of antimony to 2 hydroxyl equivalents of the citrate, to form the soluble complex:

$$HO-Sb:[O-C(COONH_4):(CH_2COONH_4)_2]_2$$

It was found that five of the six NH_4 groups may be replaced by H without affecting the solubility, but as the sixth NH_4 group is replaced solubility is rapidly decreased. The solubility of the other alkali citrate complexes was not so carefully investigated, but Sb_2O_3 in fully neutralized potassium citrate is either insoluble or forms an insoluble complex; the same is believed to hold for fully neutralized sodium citrate. When only partially neutralized citric acid is used, all of these alkali complexes are soluble. On long standing, however, the sodium citrate complexes seem to undergo some change which causes crystallization to take place in these baths. This was not observed in the other alkali citrate systems.

In the bath formulations used (Table I), from 6.7 to 13.3 oz/gal (50–100 g/l) of antimony as Sb_2O_3 was dissolved in sufficient ⅓–½ neutralized citric acid to provide at least 0.5 OH-equivalents of "free" citric acid. Here it was assumed that all the antimony first combines with the alkali citrate and then with suffi-

TABLE I. TYPICAL CITRATE BATHS FOR THE DEPOSITION OF ANTIMONY

Bath Composition	1	2	3	4	5
Antimony, as Sb_2O_3, oz/gal (g/l)	13.3 (100)	6.7 (50)	6.7 (50)	6.7 (50)	6.7 (50)
Total $H_3Cit.H_2O$, oz/gal (g/l)	51 (382)	12.3 (92)	24.6 (184)	24.6 (184)	.....
Free* $H_3Cit.H_2O$, oz/gal (g/l)	28 (210)	(a)	14 (105)	14 (105)	.....
$Na_3Cit.2H_2O$, oz/gal (g/l)	32.2 (241)	.....	.....	.....	.....
$K_3Cit.H_2O$, oz/gal (g/l)	.....	38.2 (286)	19.2 (144)	19.2 (144)	19.2 (144)
50 per cent Gluconic acid, fl.oz/gal (ml/l)	.....	.....	.....	12.8 (100)	21.8 (171)
*p*H (paper)†	3.5–3.7	4.8–5	3.5–3.7	3.5–3.7	4.7
Notes	(b)	(b)	.....	.....	(c)

Operating Conditions, all baths	
Temperature, ° F	70–160° F (21–71° C) (fairly low temperature preferred)
Cathode current density	5–50 asf (0.5–5.4 amp/dm²)
Anodes	lump antimony
Cathode current efficiency	very nearly 100 per cent
Anode current efficiency	very nearly 100 per cent

*"Free" citric acid as defined in text.
†*p*H may be reduced with H_2SO_4 or HNO_3 to 1 or less, with production of more crystalline deposit.
(a) Alkali citrate more than sufficient to form complex, hence all the acid is "free".
(b) Bath crystallizes on long standing.
(c) In this bath at least some of the antimony must be present as gluconate.

cient citric acid to form the complex; the balance of the citric acid that had been added is considered "free". Actually, of course, all the hydrogen equivalents of the citric acid constitute free acid in the usual sense. It is important to keep in mind that when considering the degree of neutralization of citric acid one is concerned with the hydrogen equivalents of the acid (three per mol), but in the formation of complexes with antimony it is the hydroxyl group which is involved; here there is but one equivalent per mol. It should also be evident that "half-neutralized citric acid" means merely that the bath contains an equal number of hydrogen equivalents of citric acid and the appropriate alkali citrate.

The experimental procedure used in most of the work was to prepare from cp chemicals in distilled water a large volume of an appropriate stock solution, which was then carbon treated and filtered. Small portions of this solution were withdrawn and the necessary additions or adjustments made for the plating tests, which were run in series in groups of six or eight. Cathode agitation, at the rate of 10–15 ft/min (3–4½ m/min), was usually employed; it was obtained by fixing the cathodes rigidly to a rod to which was applied a controlled rocking motion. Since deposition by immersion occurs on steel from these baths, copper or copper-plated cathodes were used, which were anodically cleaned and dipped in 10–15 per cent by volume hydrochloric acid. When in addition the copper was bright-dipped in nitric-sulfuric acid, the highly stressed bright deposits showed improved adhesion in that their tendency to peel was greatly reduced.

Deposits from the lithium citrate baths were the least promising. Those from the ammonium baths were generally better in appearance but more brittle than those from the sodium system. The potassium citrate system gave the best deposits, which were semibright to bright and not excessively brittle, although brittleness and microscopic cracking was observed in the brightest plates. The duller deposits appeared adherent and ductile in a mild bend test and could be buffed with surprising ease to a very high luster, which was retained without tarnishing throughout several years' exposure in the laboratory.

The deposits from the potassium bath (No. 3, Table I), with which most of the work was done, were semibright at temperatures of 70–100° F (21–38° C), adherent, and somewhat brittle. Bending a corner of the 0.016 inch (0.4 mm) thick cathode about 10° over a 1/16-inch (1.6-mm) radius caused cracking at the edges and on the compressed side of the deposit, and sharper bending caused general cracking and peeling. At higher temperatures, 120–160° F (49–71° C), the deposits were more coarsely crystalline and could withstand much more bending without cracking. These and other comments that will be made on ductility are based upon such a bend test on deposits two to three years old. The most ductile deposits obtained could be strongly flexed in both directions a number of times without general cracking, but there was almost

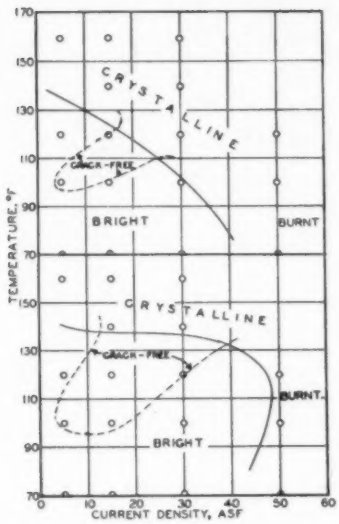


Fig. 1. Effect of deposition conditions in Bath No. 3, containing in addition, top, 50 ml/l 50 per cent gluconic acid and 10 ml/l 30 per cent hydrogen peroxide, and bottom, 100 ml/l 50 per cent gluconic acid and 20 ml/l 30 per cent hydrogen peroxide. Each area surrounded by curves represents conditions for crack-free, almost bright deposits

always a little cracking at the edges of the specimen.

Brightening in Citrate Baths

A large number of chemicals of various kinds were added to the different baths. Virtually every one had some effect for, as Mathers has remarked[7], antimony baths are extremely sensitive toward addition agents.

Organic Acids

The addition of other α-hydroxy organic acids with which antimony forms or might be expected to form complexes usually caused brightening of the deposit. These are not brighteners in the usual sense, because large amounts were necessary to cause brightness. In the case of gluconic acid, the one in this group which produced the most effect, about 2.6 fl.oz/gal (20 ml/l) of 50 per cent acid had to be used before brightening was observed, and 6.4–12.8 fl.oz/gal (50–100 ml/l) was preferred. Used without other additions, the preferred amounts of gluconic acid caused excessive anode polarization. Glycolic acid (6.4 fl.oz/gal or 50 ml/l of 70 per cent acid), lactic acid (2.6 fl.oz/gal or 20 ml/l of 85 per cent acid), or salicylic acid (1.7 oz/gal; 10 g/l); also had some brightening effect. Tartaric and malic acids, however, which also belong to this group, showed adverse effects at a concentration of 1.7 oz/gal (10 g/l).

Two other organic acids, not of this class, also were undesirable: oxalic acid (4 oz/gal; 30 g/l) caused loss of brightness, and formic acid (0.4 fl.oz/gal; 3 ml/l) caused exfoliation during plating.

Inorganic Acids

A number of inorganic acids and their alkali salts were added to these baths in concentrations of 10–50 g/l. Orthophosphates and, to a lesser extent, arsenates and sulfamates produced brightening, but the last one caused polarization at the anode. Sulfates and nitrates produced duller and more brittle deposits at *p*H 2–4; reduction of the *p*H below 2 resulted in pitting which may have been related to the tendency for insoluble compounds to precipitate in this region. Likewise the addition of alkali hydroxide to raise the *p*H of these baths above about 4.5 (paper) results in precipitation of Sb_2O_3. Fluorides, fluoborates, and fluosilicates caused precipitation either immediately or upon standing, and the deposits were coarsely crystalline. Boric and glyceroboric acids caused very poor deposits and extreme anode-polarization effects.

Metallic Salts

Metallic salts, usually citrates, when added in small quantities (0.02–2 g/l metal) sometimes caused brightening, notably those of lead, copper, or thallium, but they produced other undesirable effects almost in proportion to the degree of brightening. Over a period of time all these deposits exfoliated. Other metals tried showed less brightening effect and, in addition, were generally undesirable: silver, bismuth, zirconium, tin, molybdenum, cadmium, zinc, cobalt, and nickel. Trivalent chromium and aluminum were virtually without effect even in large quantities (15 g/l).

Miscellaneous Organic Compounds

A few organic compounds, including wetting agents, were tried in the quantities usually used in plating baths and were found undesirable. Among these were: aloin; Turkey red oil; polyvinyl alcohol; Neomerpin N; Nacconol EP; a number of the Aerosol type of wetting agents, including 1B, OT, cationic DBA and 23; Duponol ME; thiourea (0.1–8 g/l); and formaldehyde (0.5–1 ml/l 37 per cent).

Some additions reduced brightness but produced deposits which had a satiny surface easily buffed to a high luster and which were of superior ductility. Of this type were: ethylamine (5 g/l); diethylene triamine (10 g/l); arabinose (1 g/l); ceric salts (1 g/l Ce); and hydrogen peroxide (1–10 ml/l 30 per cent). The amines were neutralized with citric acid before use.

As examined under the microscope at 100 magnification most of the deposits obtained in the work thus far had tended to be very coarsely crystalline or nodular at the edges, often with cracks starting at the edges and extending more or less into the main portion of the deposit. The cracking had always been evident in the case of bright deposits. It was observed that the edges of deposits from the peroxide-containing baths were free from these defects, and it was surmised that if peroxide were added to a bath which pro-

TABLE II. STRESS IN ANTIMONY DEPOSITS
Bath 4 of Table I at *p*H 4.0 and 20 asf (2.2 amp/dm²)

30 per cent Hydrogen Peroxide		Deposit Thickness		Bath Temperature		Stress	
fl.oz/gal	ml/l	mil	μ	° F	° C	psi	kg/mm²
...	..	0.3	8	120	49	9,900	7.0
2.6	20	0.5	13	120	49	9,900	7.0
2.6	20	0.5	13	160	71	9,900	7.0

duced bright plate, the edge cracks might be eliminated and ductility might be improved.

Crack-free, Almost Bright Deposits

Several series of tests were run in which deposits were obtained from baths containing gluconic acid a d hydrogen peroxide in varying amounts under different conditions of temperature and current density. Some of the results are shown in Fig. 1. The crystalline deposits, obtained as usual at the higher temperatures, were ductile and crack-free. The bright deposits were less ductile than the crystalline ones but better in this respect than those from the bath without additions and much better than the ones from the bath containing gluconic ac'd alone. A few almost brilliant deposits were crack-free and have remained so for several years; they exhibit only very slight cloudiness. The tendency for the anodes to polarize excessively, usually exhibited by the baths containing gluconic acid, was absent when peroxide or nitric acid was also used in the bath.

A few tests were made in which the addition agent consisted of one of the brightening organic acids first reacted with an oxidizing agent, namely, hydrogen peroxide or nitric acid. The amount of oxidant used was sufficient to supply one oxygen equivalent to the organic acid. For example:

(a) 10 ml 50 per cent gluconic acid
2.5 ml concentrated nitric acid
mixture heated to 150° F (66° C) and allowed to cool and stand 24 hours

(b) 10 ml 50 per cent gluconic acid
12.5 ml 20 per cent (by volume) nitric acid
mixture allowed to stand 24 hours

(c) 10 ml 50 per cent gluconic acid
3.5 ml 30 per cent hydrogen peroxide
mixture allowed to stand 24 hours

While previous tests had shown that 10 ml/l of gluconic acid was insufficient to produce any brightening effect, any of the mixtures shown above when added in amounts equivalent to 10 ml/l of gluconic acid produced plates as bright as any that had been seen. They were cracked, however, and after several years showed exfoliation. When lactic or glycolic acids treated with oxidizing agents were used, there was some loss of brightness with embrittlement and later exfoliation. Although it would have been interesting to explore further the possibilities suggested by this later work, time did not permit.

Stress in the Deposits

During the latter part of the work, efforts were made to find means of reducing the internal stress of the deposit, since this was believed responsible for the observed cracking. The authors' technique of measuring stress was inadequate at the time that this work was done, but qualitatively it did not appear that any of the expedients tried reduced the stress materially. The method of measuring stress was later refined[13], and a few measurements have since been made (Table II) to show the order of magnitude of this factor, about 10,000 psi (7 kg/mm²).

In the calculation of these stress values, the authors used the value of 11,300,000 psi (8,000 kg/mm²) for Young's modulus of antimony which Bridgman[13] determined for an antimony wire 0.014 inch (0.35 mm) in diameter. The difficulties involved in preparing a wire of such brittle material may be imagined, and the figure cited may well be in error. It is probable, however, that there is less uncertainty in Bridgman's value of the modulus than in his value of 1560 psi (1.1 kg/mm²) for the ultimate tensile strength, because the physical condition and metallurgical history of a metal affect the ultimate strength far more than they do the modulus. Brenner[14], for example, found Young's modulus of electrodeposited nickel to vary only from 23 to 30 million psi (16,000–21,000 kg/mm²) while the ultimate strength varied from 30,000 to 160,000 psi (25–113 kg/mm²). For chromium, the same author[15] found Young's modulus to lie between 12 and 37 million psi (8,400–26,000 kg/mm²) but the ultimate strength varied much more widely, from 8,000 to 80,000 psi (5.6–56 kg/mm²). In the latter paper the remark is made that "in measuring the properties of a brittle substance . . . no reliable measurements of tensile strength can be obtained because the values are so dependent on the presence of flaws in the surface, although the modulus can be measured readily".

The ultimate tensile strength of the deposits from

baths containing peroxide (Table II) must have been above the stress values shown since these deposits are normally crack-free as laid down on a rigid base metal. The elongation of these deposits on a rigid base metal would be at least about 0.09 per cent, based on a modulus of 11,300,000 psi (8,000 kg/mm²) and a stress of 10,000 psi (7 kg/mm²).

The bath containing no peroxide, used under the conditions shown in Table II, normally produced cracked deposits on a rigid base metal; the ultimate strength of such a deposit is probably nearer Bridgman's value.

Mold Formation

All solutions containing citrate became covered with an ill-smelling mold when air had access to them. As far as could be judged the presence of the mold had no effect on the character of the deposits.

No attempt was made to prevent mold formation.

Conclusion

The successful deposition on copper or on copper-flashed steel of crack-free, almost fully bright antimony deposits from warm citrate baths containing gluconic acid and hydrogen peroxide and with soluble antimony anodes opens up the possibility of commercial use of this remarkable metal for electroplated coatings.

It also emphasizes that it is possible to modify physical properties of a metal sufficiently to overcome defects that at first sight would appear to prohibit or severely limit its use as a coating material.

Further work leading to a better understanding of the factors involved should result in still better coatings.

REFERENCES CITED

[1]Mathers, Proc. Am. Electroplaters' Soc. **27**, 134–141 (1939).
[2]Cohen, Z. Phys. Chem. **47** and **50** (1904), **52** (1905); Palmer & Palmer, Trans. Electrochem. Soc. **16**, 79 (1909).
[3]Mellor, "Treatise on Inorganic Chemistry", Vol. IX, p. 359
[4]Mathers and Means, Trans. Electrochem. Soc. **31**, 289 (1917).
[5]Stillwell and Audrieth, J. Am. Chem. Soc. **54**, 472 (1932). Kersten, Physics **2**, 274 (1932); C. A. **26**, 3709 (1932).
[6]Betts, Trans. Electrochem. Soc. **8**, 107 (1905); **28**, 325 (1915).
[7]Mathers, Means and Richard, Trans. Electrochem. Soc. **31**, 293 (1917).
[8]Duquenois, Bull. soc. chim. (5), **1**, 1387–1396 (1934); C. A. **29**, 1781 (1935).
[9]Ghosh and Kappana, J. Phys. Chem. **28**, 149 (1924). Marino, Brit. Pat. 405,433 (1934). Kohlschutter, Helv. Chim. Acta **22**, 305 (1939). Piontelli and Tremolada, Met. ital. **32**, 417 (1940); C. A. **37**, 1336 (1943).
[10]Stout and Goldstein, Trans. Electrochem. Soc. **63**, 99 (1933).
[11]Lucas and Jilek, Chem. Listy **20**, 63, 130, 170 (1926).
[12]Soderberg and Graham, Proc. Am. Electroplaters' Soc. **34**, 74 (1947).
[13]Bridgman, Phys. Rev. **9**, 138 (1917). Int. Crit. Tables, Vol. II, p. 557.
[14]Brenner and Jennings, Plating **35**, 1228 (1948).
[15]Brenner, Burkhead and Jennings, Proc. Am. Electroplaters' Soc. **34**, 60 (1947).

IMMEDIATE MEDICAL ATTENTION IMPORTANT IN CASES OF SOLVENT ILLNESS

Workers handling volatile solvents should be instructed to report promptly any feeling of discomfort. Dizziness, headache, eye difficulties, weakness, nausea, or stomach upset may be due to other causes, but they can also result from inhaling solvent vapors and may serve as an early warning that medical attention is required. Neglect of such warnings may lead to serious illness. Prompt medical attention, on the other hand, generally leads to complete recovery.

In one instance, a man spent several hours cleaning some equipment with a substantial quantity of solvent in a basement room where there was little ventilation. Several times he felt a little dizzy and went outdoors for a few breaths of air and to get away from the odor. Since this made him feel better he said nothing about his discomfort but kept at the job until it was finished. The next day he felt much worse and by the time he consulted a doctor he was seriously ill and had to be sent to the hospital.

In another case, a man entered a solvent tank to clean it, and made the serious error of entering the tank without a respirator. He became ill from the heavy solvent fumes and, instead of reporting to a physician, tried to treat himself by taking a few nips of hard liquor. A doctor would have told him that alcohol intensifies the effects of solvents on the body. His self-treatment led to serious illness.

Some persons are especially susceptible to solvent illness, and even a rather mild exposure (degreasing a motor or wiping metal parts with a solvent-saturated cloth, etc.) may lead to illness. For this reason, early signs of discomfort should not be overlooked even when it seems unlikely that much solvent has been inhaled.

While inhalation of solvent vapors is the most frequent source of solvent illness, it sometimes happens that the liquid is swallowed by mistake. The person should be made to vomit and a physician should be called at once. Also, since skin contact with solvents sometimes leads to dermatitis, persons who develop skin difficulties after working with these liquids should report to a physician to prevent aggravation of their condition.—Safety Research Institute, Inc., New York City.

chromium plating large stainless-steel welded assemblies

STAINLESS steel, even when highly finished, does not possess the brilliant color of thin chromium plate. In addition, it is likely to show slight surface rust after exposure to some atmospheres. It is, however, an almost ideal basis metal for chromium plate and requires no undercoatings of nickel or copper-nickel. Chromium plating directly on stainless steel presents certain problems, especially when large welded assemblies are to be plated in high production and the relatively high cost of the basis metal must be offset, at least partially, by economy in the finishing. How some of these problems were solved by Briggs Manufacturing Company of Detroit, the world's largest independent producer of automobile bodies, is described in this story. The material for it was obtained through Mr. Herberth E. Head, the company's Plating Supervisor, who acknowledges the assistance of Mr. Kenneth M. Huston of Armco Research Laboratories, Baltimore, Md., and Messrs. Don Austin and Sam Piken of Briggs technical staff in the solution of the problems.

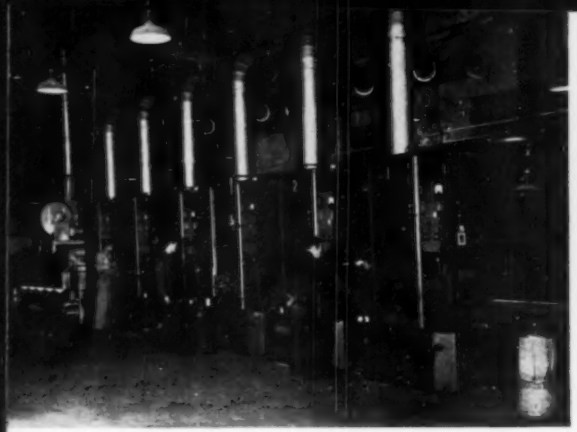
The magnitude of the operations is seen from the facts that the welded assemblies being plated are some five feet long and two feet high and that 3,000 of them are manufactured and plated each day, on a three-shift basis.

The basis metal is type 301 austenitic stainless steel (0.08–0.20 C, 16–18 Cr, 6–8 Ni) which arrives in the plant in sheet form with a No. 2B bright cold-rolled full finish. Such steel has low heat conductivity and high abrasion resistance, which puts a limit on the rate at which it can be polished and buffed. It also has low electrical conductivity, which increases the amount of copper needed in the plating racks and makes them more complex.

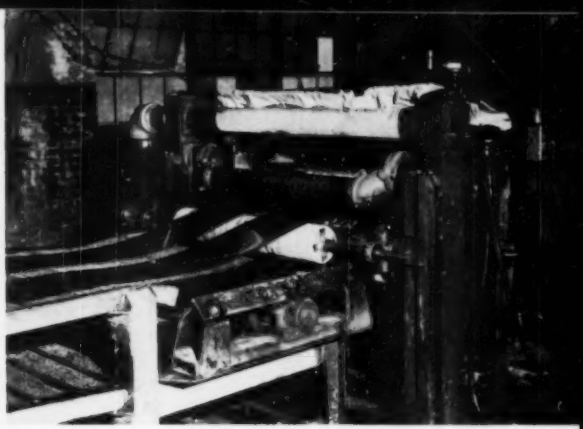
The rack problem is made even more difficult because the assemblies have more than a fair amount of recessed areas. In addition, chromium plating solution has notoriously poor throwing power and requires use of high current densities.

With lead anodes carried by the racks an additional problem is encountered in the alkaline cleaning solution. Unless the anodic current density is limited to prevent excess solution of the lead, the residue thus formed will settle on the work and give the finished parts a cloudy or gray appearance.

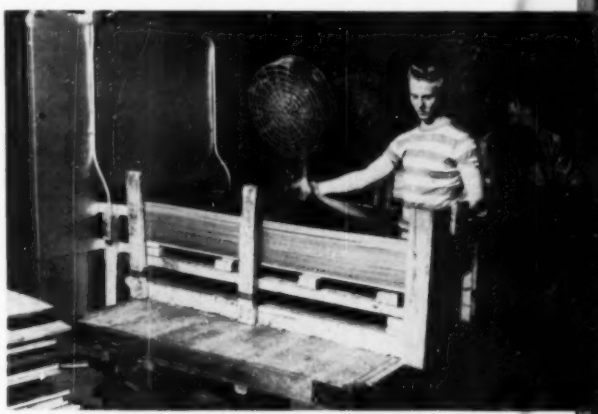
The mixed acid dip in the plating cycle is the result of compromise between the need for strong activation provided by muriatic acid, the contaminating effect of this acid in the chromium plating bath, and its attack on lead in the dip.



The stainless-steel sheets are polished before they are formed to reduce the difficulties in polishing out rolling scale. The sheets are passed under a series of abrasive belts with grain of fused aluminum oxide or silicon carbide. Belt surface speed is 6,000–8,000 feet per minute, and pressure is kept low enough to avoid overheating with consequent distortion, galling, or scoring. The sheets continue through a washing machine at left, where they are washed, rinsed, and dried. The front cover shows another view of polishing machines.

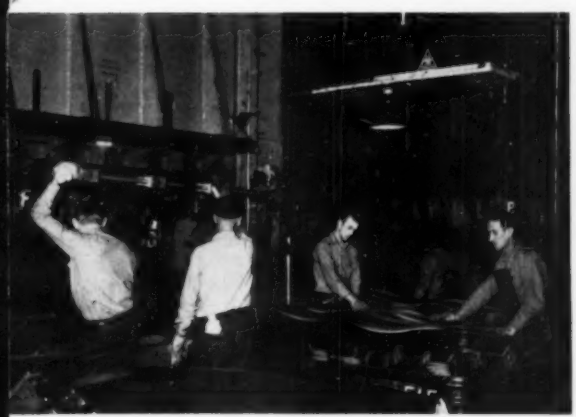


To protect the polished finish from injury during subsequent die operations, the sheets are passed through a roller coater for application of a water-soluble coating.



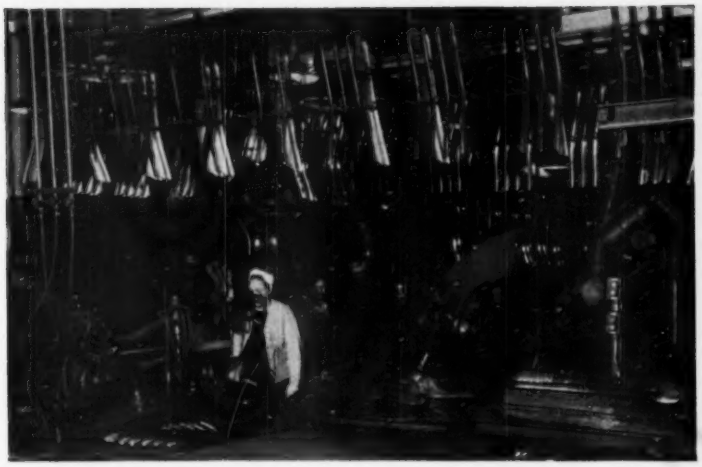
After they have been dried in an oven, the sheets are ready to be stamped.

Some of the stamping operations on the polished and coated sheets are shown here.

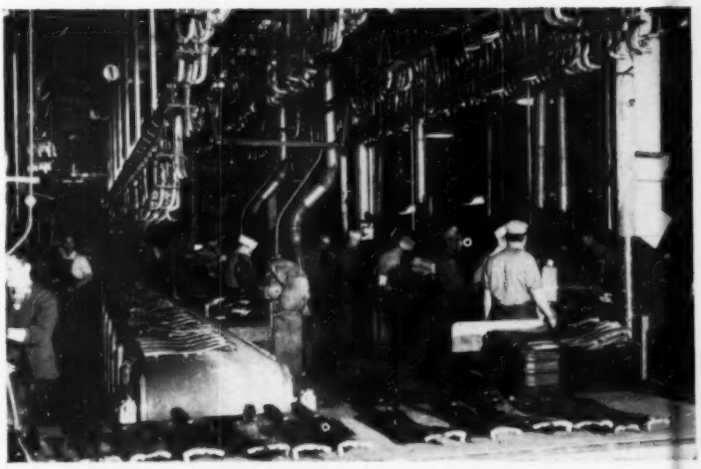


The first operations in the buffing department are removal of the water-soluble coating in the washer (left) and drying (right).

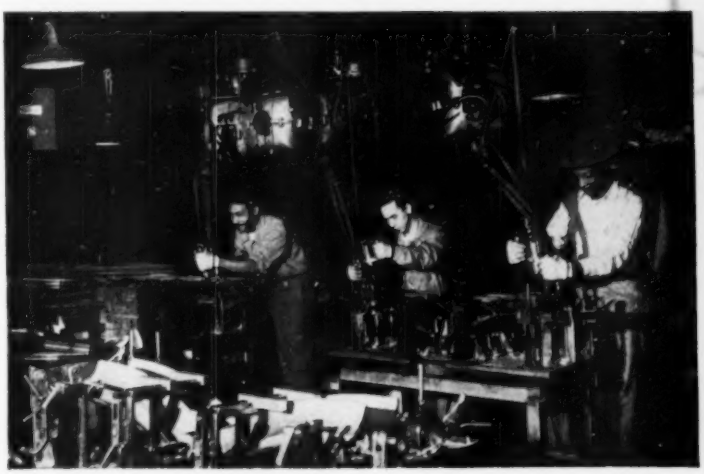
Buffing operations are performed at about 10,000 surface feet per minute and, again, at relatively low pressure to avoid overheating. Stainless steel liquid compound and so-called stainless steel coloring rouge, i. e., green chromic oxide or unfused aluminum oxide, are used to produce the desired mirror finish. Here parts are loaded onto fixtures for automatic buffing.



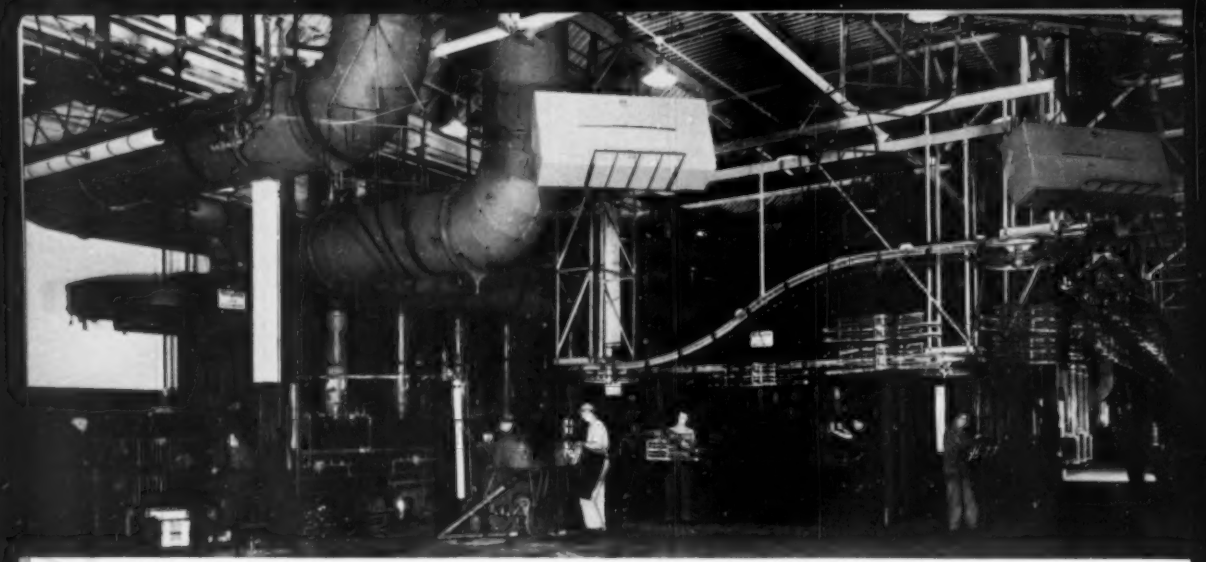
Closeup of buffing fixtures on return-type buffing unit. The spot welder is used to attach clips to parts before they go onto the buffing machine.



Areas that cannot be reached on the automatic machine, especially on ends, are buffed by hand. Note the belt transport used within the department, as well as the overhead conveyor which moves the finished parts to final assembly.

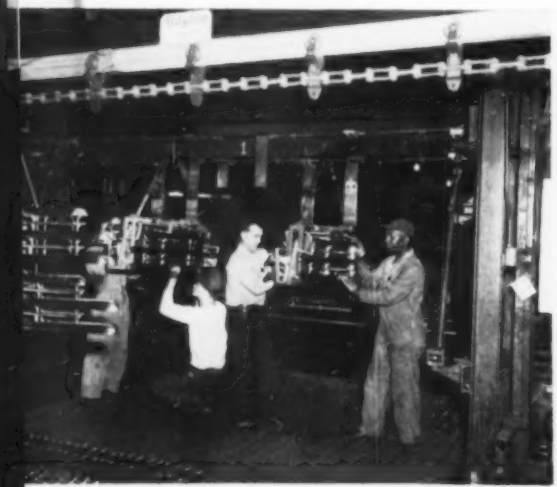


Here parts are welded into the final assembly by means of gun welders. A conveyor carrying jigs passes the parts bin where parts are fastened to the jigs. It then continues to the welders, which are pneumatic and activated by electronic devices. The welded assemblies are then placed on overhead conveyors and transported to the plating department.

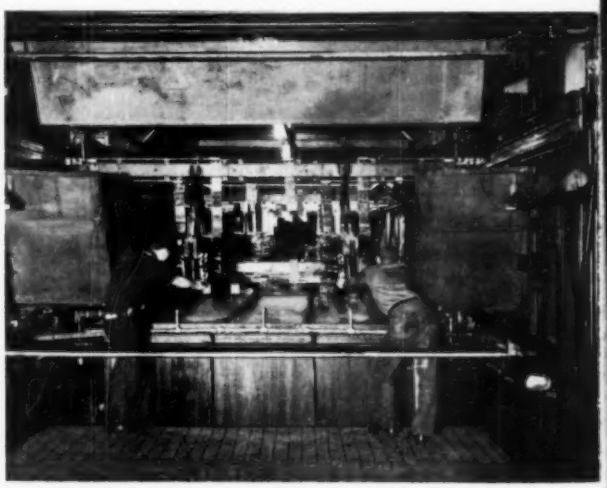


View of plating room. The parts are chromium plated on machine at right within 20 hours of having been buffed to avoid excessive passivation. The cycle is (1) soak in 4 oz/gal of each Wyandotte MK emulsion and tetrasodium pyrophosphate for 1 minute, (2) spray rinse, (3) anodic cleaning at 5 asf in 3 oz/gal Wyandotte BN cleaner for 2.25 minutes, (4) high-pressure spray rinse, (5) dip in about 1 per cent sulfuric–0.1 per cent muriatic acid (by volume) for 45 seconds, (6) immersion rinse, (7) high-pressure spray rinse, (8) chromium plate in 42 oz/gal chromic acid–0.50 oz/gal sulfuric acid at 120° F for 4 minutes, (9) pass through dragout tank (solution formed used for plating-solution upkeep), (10) immersion rinse, (11) high-pressure spray rinse, (12) hot rinse.

Loading end of the 150-foot long chromium plating automatic. The rack for two assemblies, with its auxiliary anodes and very large copper conductors, is so heavy that it is left on the machine during loading and unloading. The required current is supplied by three 10,000-ampere 12-volt plating generators and one 3,000-ampere 6-volt generator for cleaning.



Unloading end of chromium plating machine. Unless all traces of the matte pickled surface had been removed in the polishing operation the work will show cloudy or gray patches. From here the racks are returned overhead to the racking station for another cycle.



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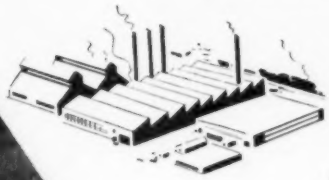

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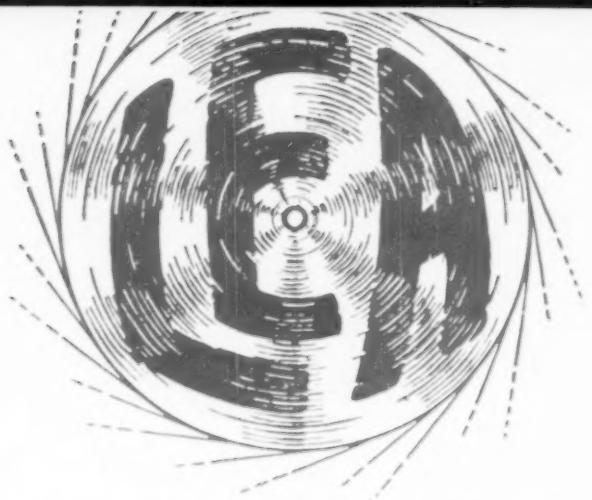

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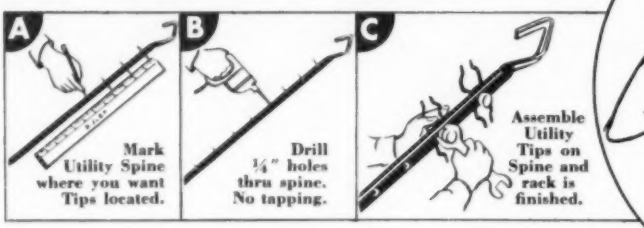
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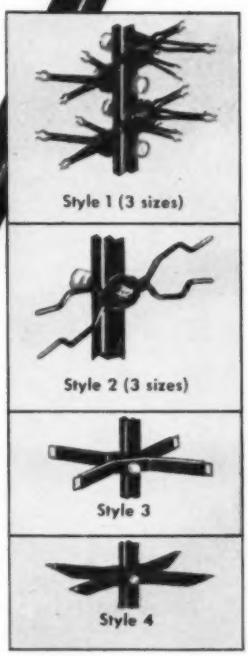

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a review

PICKLING AND PICKLING INHIBITION

ALFRED DOUTY

Chief Chemist, American Chemical Paint Company
Ambler, Pennsylvania

In this article the author reviews briefly some recent developments in the field of oxide and scale removal, with special attention to inhibitors in acid pickling solutions. Of particular interest is his discussion of hydrogen embrittlement and hydrogen blistering as they are affected by inhibitors.

PICKLING, a term derived from the culinary art of preserving foods with vinegar, in the metal field refers to the treatment of metals with acids; today, however, it has taken on a wider meaning: the removal of a layer of oxide from a metal by chemical means.

Special Pickling Methods

Note should therefore be made of three relatively new methods for oxide removal from steel. They are of interest to the plater who has to solve special problems:

1. Descaling at 700° F (370° C) by means of a fused bath of caustic soda, containing sodium hydride formed in place by addition of bricks of metallic sodium to the molten caustic soda and passage of hydrogen (usually from cracked ammonia) through the melt. This process[1] will remove scale from certain ferrous alloys which are very difficult to pickle with acids, notably stainless and tool steels containing chromium, molybdenum, wolfram (tungsten), or vanadium which all form acidic oxides.

2. Descaling by treating hot steel with flue gas and chlorine[2]. This patented process is claimed to produce excellent results but gives rise to problems of handling corrosive gases containing hydrochloric acid, chlorine and ferric chloride. Special seals are required to remove the metal through quenching water and prevent its reoxidation.

3. The treatment of hot steel, especially forgings, with certain salt mixtures to soften the scale and make it easier to remove in an acid pickling bath*.

Acid Pickling

To remove oxide from a metal, such as copper, which is above hydrogen in the electromotive series is usually quite simple. Any dilute nonoxidizing acid which forms a soluble copper salt, such as sulfuric, hydrochloric, or even acetic acid, readily does the job. The metal is unattacked by the acid as long as oxygen is absent, and, unless it is desired to brighten or polish it chemically, neither special precautions nor chemical complications enter the process. Oxide removal from steel or other metals that are more anodic than hydrogen is more complicated.

Steel scale, formed by heating in air during fabrication, consists largely of a graded layer of iron oxides ranging from magnetic oxide Fe_3O_4 on the outside to FeO near the metal surface. Under some conditions, the outermost layer may also contain Fe_2O_3. This difference in scale composition is important because the outer highly oxidized layers are relatively insoluble in acid as compared with the inner layers of FeO or of mixtures of FeO with free iron.

Except for the innermost layers, steel scale is practically undissolved by sulfuric acid solutions in any reasonable length of time. In hydrochloric acid, on the contrary, all the scale layers are relatively more soluble; still the magnetic oxide and Fe_2O_3 dissolve only very slowly.

Thanks to the difference in coefficient of expansion of steel and scale and to the brittleness of the scale, the scale is fortunately full of fine cracks. Hence when scaly steel is immersed in, say, a 10 per cent (by volume) solution of 66° Bé sulfuric acid at, say, 150° F (66° C), the acid soon penetrates the cracks and goes to work on the steel beneath with vigorous evolution of hydrogen gas. Simultaneously it eats sideways along the more soluble lower layers of the scale. The combined result of these reactions is that flakes of scale appear to "blow off" the surface exposing the steel.

*One variety of such salts has been marketed by the writer's company under the trade name Ridoxine.

By the time the last of the scale has come off, especially if some of it is "keyed" into the surface by the hot-roll pressure on an especially thick area, the following things will have happened:

1. A considerable amount of sound steel surface will have been dissolved.
2. Much acid spray will have entered the pickling room due to bubbles of evolved hydrogen breaking at the surface.
3. Considerable acid will have been uselessly consumed.
4. A certain amount of hydrogen will have entered the steel, where it may or may not cause permanent damage. The possible extent of such damage depends on (a) the kind of steel, hardenable stainless steels being most sensitive, high-carbon steels next, and low-carbon steels least sensitive (fully austenitic 18–8 steel appears completely immune); (b) the condition of the steel, hardened or highly stressed steel (internally stressed by cold deformation without subsequent annealing or externally stressed by loading of springs or lock washers) being particularly sensitive; and (c) the cleanliness of the steel, blisters being likely to develop in the tank or on standing at nonmetallic inclusions below but near the surface.

Pickle Controls

To ameliorate these effects of acid pickling, picklers soon began to add things to the pickling baths. It is interesting to note that sufficient sulfuric acid to allow its use as a pickling acid only became available around 1860. By 1883 Aiken[3] had already obtained a patent for the addition of cyanides to reduce "acid embrittlement". In 1900, patents[4] had been issued describing the use of bran and starchy substances in pickle baths. These produced a foam blanket which reduced acid spray from the bath. Additional patents appeared sparsely up to about 1920. At that time, picklers were still adding fermented "Red Dog" flour, sumac leaves, or just about every kind of organic waste to their pickling solutions.

In 1922 and 1923 appeared the significant Vogel patents[5] covering the use of coal-tar extracts containing organic bases. Since that time there has been an increasing flood of patents[6] covering a variety of materials called "inhibitors", "restrainers", or "pickle controls". Their purpose has been, and still is, to reduce the rate at which acids attack the metal without greatly reducing the speed of scale removal.

Types of Inhibitors—Among the more important classes of organic substances which have been found to have enough activity to be useful are:

1. Carbon-hydrogen-oxygen compounds: certain alcohols, aldehydes, ketones
2. Nitrogen compounds, including cyclical and noncyclical bases
3. Sulfur compounds: mercaptans, sulfoxides
4. Nitrogen-sulfur compounds: thiocyanates, thioureas, thiazoles
5. Proteins, and amino acids: gelatine, cystine, methionine, etc.

In addition, certain metals have been found to be useful under some circumstances. The outstanding example is arsenic, the profound effect of which on the rate of acid attack on metal has been described in the literature since 1845. In fact, coacting with well chosen organic partners arsenic can produce a degree of protective effect beyond that of any other substance or combination of substances known to the writer. Unfortunately the hydrogen evolved during pickling contains the extremely poisonous arsene gas.

Other metals usually have only a small effect. Copper can exert a promoter effect on nitrogenous organic inhibitors in hydrochloric acid, e. g., can improve the inhibiting effect of quinoline or can raise to the rank of inhibitors substances such as o-toluidine which would otherwise have no inhibiting value at all.

Mechanism of Inhibition—Excepting from this discussion only metallic inhibitors, which at present appear to have a unique mechanism of action, one finds that useful inhibitors work by forming on the surface of the metal an adsorbed film. This film has a structure such as to impede the diffusion of hydrogen ions and interfere with their reaching the metal surface and yielding their charges to the metal atoms (the sole mechanism of acid attack).

Chronologically the best evidence for the presence of the impeding film was discovered last[7,8]. If two pieces of steel are immersed in dilute acid and made part of an a-c bridge circuit or other suitable resistance-measuring circuit, the resistance will be found to rise sharply when a little of an inhibiting substance is added to the acid solution. The investigation disclosed further that (1) the extra resistance is proportional to the concentration of inhibiting substance; (2) the inhibiting power of the added substance is proportional to the extra resistance, i. e., of two substances the one giving the higher film resistance at the same concentration is the stronger inhibitor; and (3) a good inhibitor can produce a film with a resistance of 3 ohm/cm^2 or higher.

To these observations may be added another, also due to Machu[9,8], that no inhibitors completely cover the surface. Even under conditions of good inhibition, some 66 per cent of the surface remains uncovered. These measurements were made by the Muller[10,8] technique involving the variation of current with polarizing time.

It has also been established[11,8] that acridine, gelatin and other inhibiting substances are strongly adsorbed by iron but much less strongly by iron scale.

All these facts, taken together, make it clear that steel is protected from attack by a diffusion-retarding layer of high total porosity through fine passages. The inhibitor, being much less strongly adsorbed by the scale, has little retarding effect on its removal.

The inhibiting power of a good inhibitor may be judged from the fact that it may halve the uninhibited rate of attack on the steel when present at a concen-

tration of only one or two thousandths of a per cent.

Hydrogen Absorption

It has long been known that steel absorbs hydrogen whenever that substance is liberated upon its surface by any chemical or electrochemical method. The most modern theory of this absorption, given its present form by Zapffe[13], is as follows:

Hydrogen in gaseous form consists of molecules of paired atoms in thermal equilibrium with atomic hydrogen. At ordinary temperatures only an extremely small fraction of this gas is in the form of separate atoms, but as temperature is raised an increasingly large amount of atomic hydrogen is formed by the dissociation of its molecules. Atomic hydrogen dissolves in the iron lattice; molecular hydrogen does not. Thus while ordinary hydrogen gas does not diffuse through cold iron at a measurable rate, it does diffuse through red-hot iron because at this temperature it is to a considerable degree dissociated into atoms which dissolve in the iron and evaporate again at the other surface.

Cathodic discharge of hydrogen ion at an iron surface, even in alkaline solution, leads to a locally high concentration of hydrogen *atoms*, since hydrogen ions are discharged as single atoms. This atomic gas partly dissolves in the iron. At minor imperfections in the crystals it tends to evaporate inside the iron. This tendency, due to the great recombination affinity of the atoms, leads to enormous internal pressures. These internal pressures, which build up on pickling, may result in a number of more or less disastrous phenomena:

1. In "dirty" steel sheet with nonmetallic inclusions near its surface, blisters may appear in the sheet during pickling or later on.

2. The metal becomes brittle: wire may break in subsequent drawing, and springs may break during the pickling operation itself.

3. If hydrogen is included in steel underneath a deposit of hydrogen-impervious metal, such as zinc, cadmium, or copper, blisters may develop on standing, or especially on heating.

If not already permanently injured, steel is relieved of at least a large part of its hydrogen load on standing until the gas has evaporated, or by baking. Treatments which have been found necessary to relieve hydrogen embrittlement in particular cases are the following:

1. For cartridge cases, after annealing and pickling —1–2 hours in an air oven at 400° F (204° C).

2. For chromium-plated cutting tools—4 hours under oil at 350° F (177° C). Langdon and Grossman[13] as early as 1920 indicated that 10 minutes in boiling water does much to relieve steel of hydrogen absorbed during chromium plating or pickling.

Effect of Inhibitors on Hydrogen Embrittlement—It would be expected, since inhibitors reduce the rate of metal attack and hence the rate of hydrogen evolution, that less hydrogen would be absorbed by metal pickled with the use of inhibitors. This is sometimes the case, and it was assumed until relatively recently that it was always the case. Credit goes to Zapffe[14] for discovering that many good inhibitors of metal attack do not reduce hydrogen embrittlement. The writer's laboratory has confirmed Zapffe's observations and has been able by systematic investigation to develop inhibitors which greatly reduce hydrogen absorption by the metal.

Inhibitors in the Plating Plant

It is unfortunate that the use of inhibitors by the plater is not unattended by dangers[15]. Since inhibitors act by virtue of film formation on the metal surface, it is obvious that such film must be removed in a subsequent step before plating. For example, inhibitors are available which have high solubility and are readily removed by anodic cleaning or by nitric acid desmutting dips. However, all such materials should be used with due precaution.

Thus in every case the plater should compare the effect on adhesion and appearance of plate, tendency to blister on heating, etc., of pickling with and without a proposed inhibitor.

In addition, he should test the effect of such small amounts of inhibitor substance which are likely to be carried into the strike or perhaps even into the main plating bath and avoid inhibitors which cause difficulty. Many useful inhibitors are of such a nature as to be readily removed from plating solutions by carbon filtration.

REFERENCES CITED

[1]"Sodium Hydride Descaling", Technical Data Sheet, E. I. duPont de Nemours & Company, Electrochemical Department, Niagara Falls, N. Y.

[2]J. J. Turin, Iron Age **153**, 64 (1944); U. S. Pat. 2,288,980 (July 7, 1942). J. C. Redmond and R. W. Hodil, U. S. Pat. 2,199,418 (May 7, 1940).

[3]B. F. Aiken et al., U. S. Pat. 288,150 (1883).

[4]C. E. Robinson and W. L. Sutherland, U. S. Pat. 640,491 (1900).

[5]O. Vogel, U. S. Pats. 1,433,579 (October 31, 1922) and 1,460,395 (July 3, 1923).

[6]See W. G. Imhoff, Wire and Wire Products **21**, 599, 673 (1946) and E. Boye, Chem. Ztg. **67**, 302 (October 13, 1943) for bibliography and general discussion.

[7]W. Machu, Korrosion u. Metallschutz **13**, 1, 20 (1937).

[8]W. Machu, Trans. Electrochem. Soc. **72**, 333–359 (1937).

[9]W. Machu, Korrosion u. Metallschutz **10**, 277–288 (1934).

[10]W. J. Müller, "Die Bedeckungstheorie der Passivität der Metalle und ihre experimentelle Begründung", Verlag Chemie (1934); Trans. Faraday Soc. **27**, 737 (1931).

[11]H. Bablik, Korrosion u. Metallschutz **4**, 179 (1928).

[12]C. A. Zapffe and M. E. Haslem, Wire and Wire Products **21**, 149 (1946). See also C. A. Zapffe and C. L. Faust, Proc. Am. Electroplaters' Soc. **28**, 1–25 (1940).

[13]S. C. Langdon and M. A. Grossman, Trans. Electrochem. Soc. **37**, 543 (1920).

[14]C. A. Zapffe and M. E. Haslem, Wire and Wire Products **23**, 933, 1048, 1126 (1948).

[15]W. R. Meyer and others, Proc. Am. Electroplaters' Soc. **36**, 131–132 (1949) in discussion.

leaders in the industry xxii

r. b. Saltonstall

R. B. SALTONSTALL, Technical Director of The Udylite Corporation, has behind him what he calls a "mottled" career.

Born in Cheboygan, Mich., on January 17, 1906, he went to grade and high school in Charlevoix, Mich. In 1923 he entered Olivett College and received his B.S. degree four years later with a chemistry major and physics minor. He then went back to high school, in Charlotte, Mich., where he taught chemistry and directed the high school band and orchestra for three years.

Michigan State College was the next step on the way. There Dr. Saltonstall obtained his M.S. and Ph.D. degrees and served as part-time laboratory instructor in college chemistry, physical chemistry, electroorganic preparations, and electroplating chemistry. He also played saxophone and clarinet in the R. O. T. C. band.

On leaving Michigan State, in 1935, the new Ph.D. became a plater's helper for three months with the Ternstedt Division of General Motors Corporation in Detroit and began learning about practical applications of electroplating, especially of automotive die castings. His interest in the shop man's manifold problems dates from this experience. He then moved to Jackson, Mich., as control chemist in the electroplating department of Hancock Manufacturing Company.

In 1936 Dr. Saltonstall joined The Udylite Corporation in Detroit which had then embarked on an ambitious program of plating-solution investigations. Here he served first as a Research Chemist and later as Service Manager. In 1943 he was advanced to Technical Director, a position which he now holds. In these capacities he has been closely associated with the development and marketing of bright nickel and other plating processes.

Dr. Saltonstall is active in a number of technical societies. In the American Society for Testing Materials he is the busy Secretary of Committee B-8 on Electrodeposited Metallic Coatings and serves on several other committees. In the American Electroplaters' Society he has been Librarian, President and member of the Board of Managers of its Detroit Branch, as well as a Convention Delegate on several occasions and Chairman of Research Project Committees Nos. 3 and 8 and of the 1946 Paper Awards Committee. Other societies of which he is a member include The Electrochemical Society, the Society of Automotive Engineers, and the Engineering Society of Detroit.

During the past several years he has given much appreciated talks on a variety of practical plating problems before a number of A. E. S. branches. Several of them have been published in PLATING, of which he is an energetic Associate Editor.

Among Dr. Saltonstall's hobbies, music probably is first in importance. In recent years he has been active in S. P. E. B. S. Q. S. A., Inc. (Society for the Preservation and Encouragement of Barber Shop Quartet Singing in America, Incorporated). Many have seen him busy forming impromptu quartets with like-minded fellows at conventions and other meetings and heard the results of his efforts. During summer-month week-ends he is usually found in Charlevoix, Mich., where he enjoys sail boating, swimming, fishing or just plain loafing.

HEALTH AND INDUSTRIAL HAZARDS IN THE PLATING INDUSTRY

REUEL C. STRATTON

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THE STRIDES which safety has made in industry in general has by no means skipped the electroplating industry. The plating plant today is not overlooked by the safety engineer or the industrial hygienist, nor is it considered an exceptionally hazardous place to work provided the basic fundamentals which control the hazardous operation of any particular process are followed generally. The electrodeposition of metals today is in principle little different than the similar deposition of the same metal years ago, although there have been improvements in plating solutions and techniques. The introduction of continuous plating machines and much of the other mechanical improvement in the electroplating industry have brought with them commensurate safety.

This subject may be logically divided into two parts. The hazards which cause industrial accidents are one part, while the hazards to health or the hazards involving industrial hygiene are a second part. While there is certain overlapping of control, it would appear preferable in this short discussion to consider the items separately.

Prevention of Injury

The prevention of injuries in an electroplating establishment or in the electroplating department of a plant calls for the same effort in the promulgation and operation of an industrial safety program as in any other branch of industry. Safeguards adequate for the exposure and operating safety rules are a necessity, and the workmen in an electroplating department should utilize such safeguards and observe all safety rules of the plant the same as the workers in any other department.

Just why electroplating for many years has been, in general, considered a potentially hazardous industry, although in reality it is no more hazardous than many other industries, is not known. In all probability, this opinion has been generated because of the imposing array of hazards based chiefly on chemical terms presented in any discussion of the industry. It is indeed unfortunate that most plants do not separate their accident records and segregate the plating department. One would venture the opinion that if it were possible to segregate the injury records of a plating establishment from those of the remainder of the plant it would be found that the usual run-of-the-mill accidents are just as prevalent in the plating department as elsewhere.

In attempting to differentiate the contract plating establishment from the plating department operated as an adjunct to a manufacturing plant, this writer has been unable to secure any specific, clearly defined accident data to show any difference, operation for operation.

There are a few hazards peculiar to the plating industry which should be recognized and controlled. Obviously, plating work is wet work. Wet places produce slippery floors, with accompanying falls of persons. Damp atmospheres are conducive to certain industrial-hygiene hazards and at the same time increase the need for continuous mechanical maintenance within the department. The hazard of lifting is increased too. While this discussion is not intended to deal with every detail of the problem, because each plant is a little different from the other, yet there are certain simple principles which must be observed generally. These principles are (a) the provision of proper plating equipment, (b) the correct installation of all such equipment, (c) the provision of proper personal protective equipment and safety devices, and (d) the establishment of an effective accident-control program, directed through an interested management but with the responsibility for safety never pushed down so far

below top management that interest becomes lost until some serious or unusual accident occurs. Management has found that it pays dividends to furnish good and proper equipment, good tools, a good plant, and then to provide capable supervision to make certain that the plant and its equipment are used in the manner intended. This is generally brought about through a well organized cooperative safety program, which is adequate but not elaborate and through which employees may be trained and educated to the realization that they have a very definite responsibility and obligation for their own safety and their own health, as well as that of their fellow workers.

Other than the usual hazards of traumatic, or bodily, injuries, many of which are heightened by the wet conditions of the usual plating room, there is the particular exposure caused through the storage of large quantities of materials necessary for carrying on the work. It is important that adequate storage space be supplied, not only for raw materials used in the plating, such as metals and chemicals, but also for the large quantities of parts which are "in line" for the plating operation. Almost 25 per cent of all compensation cases in the industry occur in the handling of materials or tools. About 20 per cent of all injuries are caused by falls, and another high percentage is caused by falling objects striking workers. Recently it was determined that falling objects and falls accounted for 34 per cent of all fatal cases in all industry while falls, being struck by falling objects, and handling of material accounted for 45 per cent of all permanent partial disabilities and the same causes accounted for 55 per cent of the minor injuries. The hazards which cause such injuries are always present in every electroplating establishment, but they can be corrected easily by application of the necessary control measures.

While there is some hazard from the exposure to electric current and the possibility of contact with electric-current-carrying equipment, injuries from such exposures have not been too prevalent. However, it should be remembered that all electric equipment should be protected, guarded where necessary, and, above all, installed according to the requirements of the National Electrical Code. Haphazard wiring, the use of improper extension cords, the failure to ground equipment properly, and other similar bad practices should not be permitted.

Prevention of Health Hazards

Turning now to the health hazards of the electroplating industry, there are many chemicals used which are well recognized as being toxic. The effects of such toxic materials on the human body may be classed as (a) local and (b) systemic. The so-called local effects include skin irritations, eye injuries, and burns. Of these, the skin irritations are, as is well known, most frequent. Systemic effects may be created through absorption of toxic material through the skin, by inhalation into the lungs and from there into the body, or by ingestion through eating of contaminated food or contamination of other objects which may be placed in the mouth.

An industrial-hygiene exposure occurs in the operations prior to actual plating. If the grinding, polishing and buffing department is counted as a part of the electroplating plant, one must consider the respiratory hazard created through the breathing of air containing silica particles. This exposure is usually not too important in the plating industry, because today most of these operations make use of synthetic abrasives which are less hazardous. Improved exhaust ventilation too has been most effective in protecting against dust hazards.

Degreasing and wet cleaning of metal parts may involve exposure to such materials as trichloroethylene, benzol, gasoline, carbon tetrachloride, etc. All chlorinated solvents are hazardous, and the vapors of such solvents do cause irritation to the eyes, nose, throat, and lungs. The exposure of the skin to such liquids may create a substantial dermatitis and also may cause systemic response through the absorption of the material into the body.

Many of the chemicals used in the plating industry are substantially poisonous and may produce a serious health hazard. For example, such metal ions as lead, cadmium, and gold, and cyanides, sulfides, and other anions may be extremely toxic. Because these chemicals insure good electrodeposition, they must be employed by the industry; but such employment makes it necessary that the greatest care be exercised in order that commensurate health protection goes along with their use.

The environment in some electroplating processes tends to enhance toxic reactions. The factors of dampness, heat, and inadequate ventilation may affect the physical condition of the body and make absorption that much more easy. Certain metallic compounds show marked toxicities for persons who perspire excessively. Dampness will naturally tend to hold the salts in a more active state upon the skin.

Of the great number of materials which are used in the plating industry only one or two will be touched upon as providing a pattern for the control of others. The manner in which chromic acid is used makes it readily available as a hazardous material on inhalation, contact, or ingestion. Chrome burns, chrome ulcers, and chrome holes, as well as other skin effects, particularly at the base of the nails, have been recognized for long periods of time. Chromic acid is especially dangerous in concentrated solution. Accidental ingestion of chromium, or chromates, requires prompt treatment. However, when chromium plating was first introduced and the hazards became known, industrial steps were taken to eliminate the hazard. This was done first by improved and increased ventilation, particularly the lateral type of ventilation at the disengaging surface of the liquid, and later by the use of styrene rods or beads on the surface of the liquid

in the tank. The effectiveness of this latter protective measure was proven recently by a New York State survey, wherein it was observed through actual sampling that the concentration of chromic acid mist decreased continuously with an increase in thickness of the bead layer. While it was not possible to eliminate the need for ventilation entirely, yet it was found that the ventilation requirements could be materially reduced with a commensurate saving in power cost.

Exposure to cyanides, particularly to hydrocyanic gas which may be accidentally created through the mixing of a cyanide and an acid, should be controlled in all plants. Exposure to such materials may result in very rapid acute poisoning cases, usually fatal in result.

Much has been done to control industrial exposures through the installation of automatic-machine plating whereby the operators are exposed much less than previously.

Fortunately, the toxicity of most materials used by the plating industry is well known and, therefore, the amount permitted to gain access to the air of the work room can be collected, analyzed, and controlled.

Admitting that specific hazards exist in an electroplating establishment, what may be done to control them? Obviously, the control varies with the establishment, and no arbitrary rule or code can be prescribed. Certain basic principles are commonly utilized and include (a) sustitution of harmless or comparatively harmless materials for dangerous ones, (b) isolation or mechanical guarding of harmful processes, (c) provision of local exhaust ventilation to prevent toxic materials from reaching the breathing level, (d) provision and use of personal protective devices, and (e) provision and use of personal hygienic measures, such as frequent washing, bathing, and the use of proper work clothing.

Recommendations by National Safety Council

A resume of the required precautions is abstracted from an industrial data sheet provided by the National Safety Council. The precautions suggested, while general in nature, do provide the basis upon which an individual plant program may be built. These include:

(a) The floors of electroplating rooms should be smooth, water tight, preferably of a plastic asphalt compound, and should slope to a central drain where spilled liquids may be collected or neutralized before they pass to the sewer.

(b) Containers in which toxic supplies are kept should be plainly marked and stored separately.

(c) All electroplating rooms should be equipped with an efficient exhaust-ventilation system. This includes not only required general exhaust but also the individual tank exhaust needed for specific electroplating operations, such as chromium.

(d) The storage of food, or the eating of food, should not be permitted in electroplating rooms or in the places where electroplating chemicals are used or stored.

(e) Adequate washing facilities should be provided in conjunction with electroplating rooms or nearby, and each employee should be encouraged and possibly required to use such facilities before leaving the plant or before partaking of food. Workers whould be cautioned to use plenty of water to wash away immediately any contamination which may have come in contact with the skin. A special type of fountain should be provided for the cleansing of eyes that may have been affected.

(f) It is especially important that workers wear correct safety clothing. Rubber boots, gloves, aprons and coats, acid hoods or splashproof goggles or both, woolen shirts and trousers, and other types of personal protective equipment should be supplied or made available. There are certain clothing tips for maximum safety. A broad brimmed hat to protect the face and neck against possible dripping of chemicals from overhead is valuable. Collars should be kept closely buttoned and the gloves should be tucked under the sleeves, while the trouser leg should be worn outside the boots. It is important that splashproof goggles should be worn on all jobs where there is a definite chemical hazard to the eyes.

(g) The foregoing are chiefly preventive measures, but equally important is the availability of first aid and medical care when an injury or an ailment has been suffered. Skin infections, the most common hazard in the electroplating industry, are not usually so urgent as to make first aid immediately necessary, other than immediate and copious washing. However, a neutralizing agent should not be used, except upon a physician's advice. Most important is to have medical care available. It should be borne in mind that treatment afterwards is "locking the barn door after the horse has been stolen". For the good of the worker and for the betterment of the industry, a real medical program of prevention is essential. Such a program should obviously be developed under the guidance of a medical consultant thoroughly familiar with the possible exposures in the electroplating industry and should be coupled with pre-placement examination of applicants for work, as well as regular physical examinations, to make certain that no physiological response from any of the chemicals or processes is likely to develop to a point where harm may result.

Hazards Outside the Plant

It would be remiss not to mention the need for extending safety measures beyond the confines of the plant. With the present trend to legislate the control of the effluent from industrial plants, both gaseous and liquid, it has become increasingly important, in fact imperative, that due consideration be given to exposures involving the public or the property of others. The courts have shown a growing tendency to hold industrial plants responsible for damage occurring off the premises, where the source of the damage can be

(*Continued on page 286*)

A TECHNICAL INFORMATION FILE

for the plater and metal finisher

WILLIAM P. FOLEY

Lee Silver Service, Detroit, Michigan

IN THE COURSE of several years' experience in job-shop plating, this writer became first vaguely annoyed and finally downright disgusted with the ever-increasing quantity of unsorted and haphazardly arranged technical bulletins, formulas, and general plating information. Like most platers he was accumulating this material in the commendable hope of putting it to good use at a future date.

Few people like to spend an hour sorting through stacks of papers in an effort to locate the suddenly pertinent information recalled as having been read casually some time ago. Too often the tendency is to be satisfied with the relative inefficiency and uncertainty of an outdated method of handling a new plating problem.

The first naturally occurring thought was to file the material under general headings such as "Copper", Nickel", "Cleaning", etc. It was soon realized, however, that such a system easily lent itself to ambiguous interpretations. An example is the minor quandary of whether to include—and subsequently remember to search for—under the heading of "Brass" both literature concerned with deposition of, and methods of plating on, this metal. As a result a more rational system was adopted, which is outlined here as briefly as possible.

METAL FINISHING TECHNICAL FILE

(Outline of Classifications)

REFERENCES—Handbooks, Tables, Calculations, Material in Frequent Use

RECORDS—Maintenance and Analytical

ELECTRODEPOSITION
- Brass and Bronze
- Cadmium
- Chromium
- Copper
- Gold
- Lead
- Nickel
- Silver
- Tin
- Zinc

Alloy Deposits—Cadmium-Bronze, Tin-Lead, Speculum, etc.

Rare Metals—Rhodium, Indium, Platinum, etc.

METHODS OF PLATING
- Zinc Diecastings and Zinc Alloys
- Aluminum, Magnesium and their Alloys
- Stainless Steel, Monel, Inconel, etc.
- Special Alloys
- Nonconductors

CONVERSION COATINGS—Anodizing, Dip Coatings, etc.

SPECIAL PROCESSES—Periodic Reverse Current Plating, Parkerizing, Corronizing, etc.

CLEANING METHODS

PICKLING AND SCALE REMOVAL

STRIPPING DEPOSITS

ELECTROPOLISHING

ELECTROFORMING

PROPERTIES OF DEPOSITS—Physical, Mechanical and Chemical

TESTING DEPOSITS—Thickness, Adhesion, Porosity, Corrosion Resistance, Stress, etc.

CONTROL
Analytical Methods and Formulas
Purification and Treatment of Solutions

LABORATORY—Layouts, Technique, Equipment

MECHANICAL FINISHING
Buffing and Polishing
Barrel Work—Tumbling, Deburring, Burnishing

PLANT ENGINEERING
Methods—Heating, Exhaust, Filtration, Drainage, Waste Disposal, Safety, etc.
Equipment—Racks, Power, Tanks
Specifications and Prints

ORGANIC FINISHING
Methods and Equipment
Materials

COSTS AND COST ESTIMATES

LABOR AND WAGES

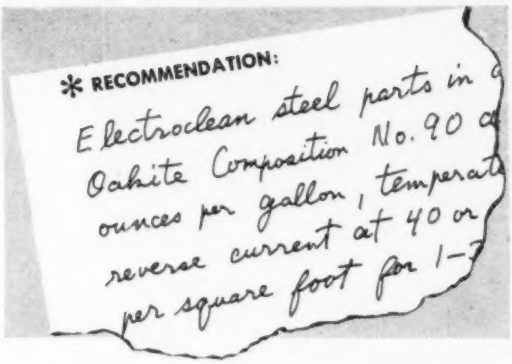
MISCELLANEOUS—Papers, Reports, Devices

The material components of the filing system can be consistent with the degree of permanency desired. Heavy card-index guides, obtainable with metal tabs at a cost of 15–20 cents in all office-supply establishments, are most durable and afford full visibility of all section headings.

As a method of greatly enlarging the scope of the information filed, there can be included a loose-leaf folder in which, by means of tabbed organizer sheets, the preceding classifications and subdivisions are duplicated. The usefulness of this feature, for indexing of information as well as facilitating cross reference, becomes immediately evident when it is realized that the recipient of such trade publications as "Plating", "Metal Finishing", etc., needs to spend no more than fifteen minutes per month to jot down, from the table of contents, titles and dates of articles which can be of future use. He will thus have close at hand a subject index of all information in his possession which can assist in working our the problems of the moment. Needless to say only the ambition of the compiler limits the extent to which information in past publications can be included.

The past months, during which this filing arrangement has been doing a fine job for the writer and his associates, have afforded a good bit of satisfaction at being able to lay hands on the desired information at the moment it was needed.

Since to date there has been no need for revisions or additions, the system appears comprehensive enough for most platers. It is hoped that this article may furnish the incentive, as well as a framework, that will permit one to get full value from the potentially vital facts and figures that lie dustily in odd corners of the shop until they are consigned to the wastebasket.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Acknowledgment is due the Research Committee, Dr. Louis Weisberg, Consulting Chemist, New York City, Chairman; the Research Directing Committee, Mr. William M. Tucker, Eastman Kodak Company and Dr. W. A. Wesley, The International Nickel Company, Chairman and Vice-Chairman, respectively; and the Project Committee, Dr. W. A. Wesley, Chairman; Dr. B. Egeberg, International Silver Company, and Mr. A. Mendizza, Bell Telephone Laboratories, Inc., for their contributions to this project.

*AUTHORS

Porosity of Electrodeposited Metals

VI. EFFECT OF SURFACE STRUCTURE OF THE BASE METAL ON THE PERMEABILITY AND CORRODIBILITY OF DEPOSITS

The invisible fine porosity of electrodeposited metals, expressed by measurable permeability to gases of thin foils as described in our foregoing communications, has been further investigated from the point of view of a possible relation between the degree of permeability and the condition of the base-metal surface on which the deposit is produced, all other factors being equal. The leading consideration was that looseness or tightness of a deposit, i. e., the amount of gaps and discontinuities throughout its structure, must to some extent at least be determined by the way in which the very first layers of the deposits distribute themselves over the base surface. Hence it was to be expected that the condition of that surface, governing as it does the infancy of the deposit, will be reflected in the degree of its gas permeability. It also appeared of interest to investigate possible differences of permeability of deposits produced on entirely different metals. Finally, as will be more fully related in our following communications, all our experience so far points to the conclusion that deposits of the same metal, produced under otherwise identical conditions but with just one factor varied so as to result in unequal gas permeabilities of thin foils, generally corrode at unequal rates; specifically, impermeable thick deposits corrode relatively faster (as measured by the rate of increase of the permeability) when they in thin layers show

TABLE I. PERMEABILITY CONSTANT k OF NICKEL DEPOSITS
k in liter/cm²·minute

Thickness microns	Base Metal Surface			
	Stainless Steel	Copper		
	Buffed 1	Buffed 2	Etched 3	Electropolished 4
4	60×10^{-4}			
4.5			10×10^{-4}	6.3×10^{-4}
5		9×10^{-4}		
6	9×10^{-4}	6.7×10^{-4}	3.2×10^{-4}	1.9×10^{-4}
8	0.28×10^{-4}	0.28×10^{-4}	0.25×10^{-4}	0.22×10^{-4}

TABLE II. PERMEABILITY CONSTANT k OF IRON DEPOSITS

Base metal surface: copper k in liter/cm²-minute

Thickness microns	Copper Surface		
	Buffed 2	Etched 3	Electropolished 4
15	2.0×10^{-5}	1.3×10^{-5}	1.4×10^{-5}
20	1.0×10^{-5}	0.83×10^{-5}	0.9×10^{-5}
30	0.24×10^{-5}	0.20×10^{-5}	0.22×10^{-5}

TABLE III. PERMEABILITY CONSTANT OF ELECTROLYTIC NICKEL IN ATMOSPHERIC EXPOSURE ON LABORATORY ROOF IN PRINCETON, N. J.

Base metal surface: copper Nickel foil thickness: 25 microns

k in liter/cm²-minute

Time days	Copper Surface	
	Buffed 2	Etched 3
0	0	0
10	0.20×10^{-5}	0.05×10^{-5}
16	0.83×10^{-5}	0.22×10^{-5}
26	5.5×10^{-5}	3.1×10^{-5}

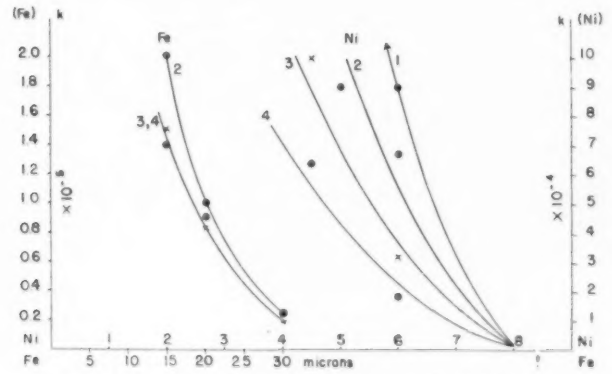


Fig. 1. Variations of permeability constants for electrolytic iron (left) and nickel (right) with thickness and surface structure

the greater permeability. The question was whether this would hold also with respect to deposits differing in thin-foil permeability owing to differences of the base surface condition.

With regard to initial permeability, we compared nickel deposits, all produced from a purified Watts bath of *p*H 2.5 at 60° C (140° F) and 2 amp/dm² (19 asf), on (1) stainless steel, mechanically buffed, cleaned with solvent, then subjected to alkaline cathodic cleaning followed by an acid dip (a few seconds in dilute sulfuric acid) and rinse, (2) electrolytic copper (from an acid copper sulfate bath), mechanically buffed and cleaned as above, (3) electrolytic copper, etched with dilute sulfuric acid and rinsed, and (4) electrolytic copper, anodically electropolished in a solution of 63 per cent (by weight) of phosphoric acid and 37 per cent water at 20° C (68° F) and 1 amp/dm² (9 asf), then rinsed. Deposits produced by method 1 were separated from the base by simple lifting; in cases 2, 3, and 4, the base was dissolved by a few hours' immersion in a 10 per cent potassium cyanide solution.

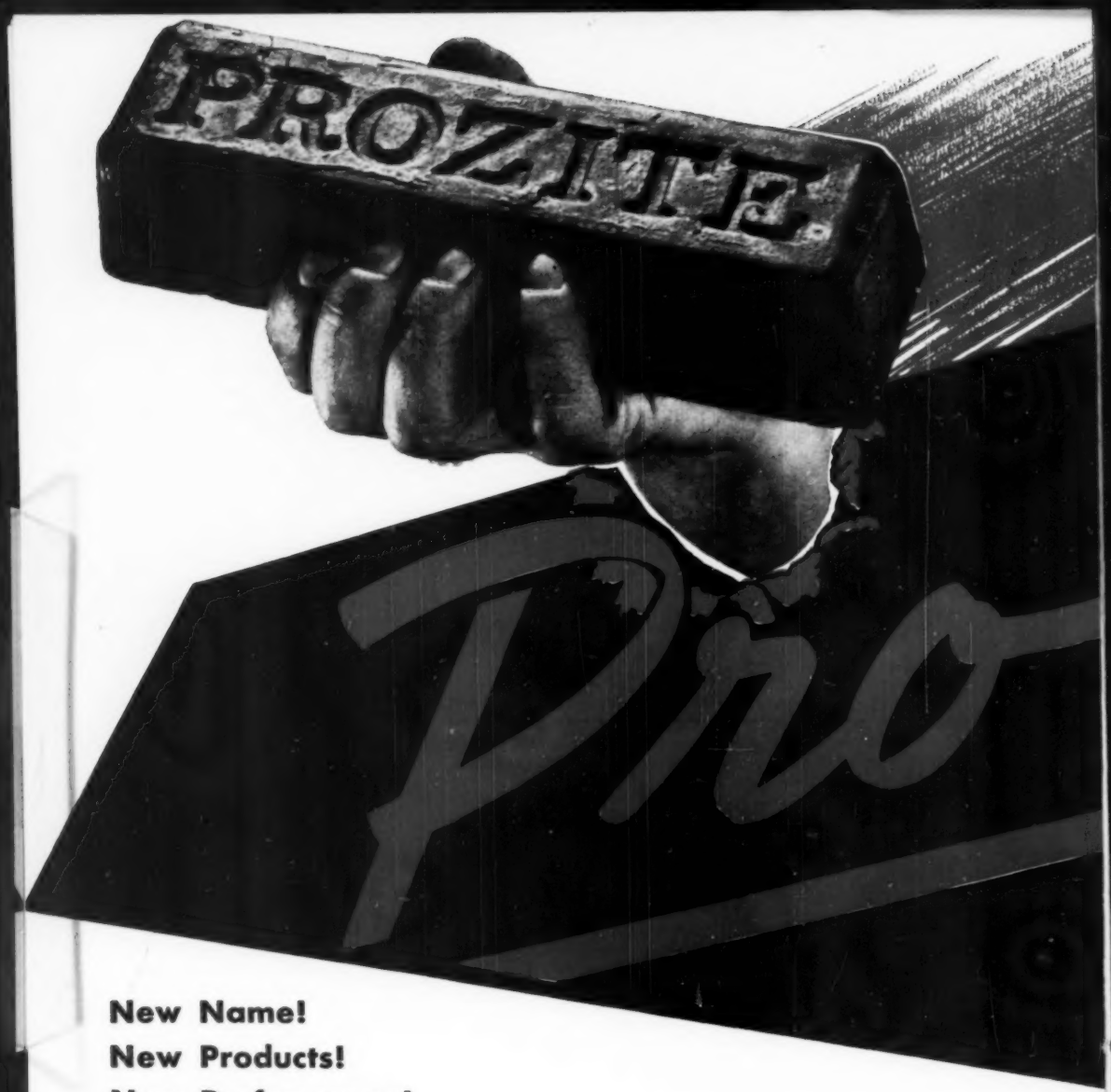
Further comparative tests were made with electrolytic iron foils, made by deposition from a solution of 375 g/l (50 oz/gal) ferrous chloride, 187 g/l (25 oz/gal) calcium chloride, and 0.1-*N* hydrochloric acid at 90° C (194° F) and 6 amp/dm² (56 asf) on copper surfaces 2, 3, and 4, followed by solution of the copper in 10 per cent potassium cyanide. Deposits of iron on stainless steel (1) could not be tested as they cannot be easily lifted from that base. That the nickel and the iron foils suffer no damage in the process of solution was proven by the fact that their permeability does not in any way change when the immersion in potassium cyanide is continued for several more days. All foils were inspected under a low-power binocular microscope (X 34) for absence of visible pores*.

Results of the measurements are summarized in Tables I and II and in Fig. 1. Thicknesses are given in microns (25 microns = 1 mil), permeabilities in terms of the permeability constant k, in liter/cm²-minute.

While isolated determinations do not immediately show a strikingly conclusive trend, it is revealed immediately by the plots in Fig. 1. The right-hand and the left-hand scale of k refer, respectively, to nickel and of the iron foils are given, respectively, in the upper and the lower line of the axis of thicknesses. If the most probable curves are drawn through the somewhat scattered experimental points, as can be done without ambiguity, it immediately becomes evident that, at equal thickness, the permeabilities of nickel foils decrease in the order 1, 2, 3, 4. In other words, thin deposits produced on mechanically polished surfaces are distinctly more permeable than equally thin deposits produced on crystalline surfaces. In this connection it is noteworthy that the very highly lustrous electropolished surface appears to be a crystalline surface, in contrast to the mechanically polished, flowed surface*.

*We use a low-power binocular microscope for routine inspection because of the rapidity of the exploration. It has been previously established, in a few test cases, that foils which are found sound under low magnification show no perforations in examination under a regular high-power microscope.

*In a polycrystalline copper surface, electropolishing does destroy the crystal pattern seen in electron diffraction. This, however, indicates only extreme smoothing of the surface and possibly extreme fineness of the grain, not destruction of crystallinity. That this is so follows from the observation that the diffraction pattern of *single* crystals of copper is not destroyed by electropolishing. In contrast thereto, mechanical polishing distorts the crystals and flows the metal.



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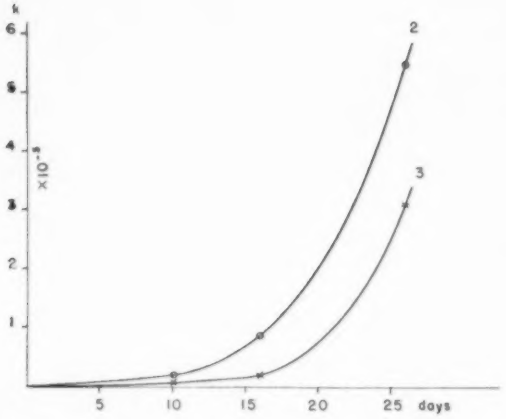

Fig. 2. Change in permeability constant of electrolytic nickel with time in Princeton atmosphere as affected by surface structure

The pattern repeats itself in the case of the iron deposits (left-hand group of curves), only, in this case, 3 and 4 have become indistinguishable and the two curves merge into one.

The general conclusion that thin deposits on polished surfaces are more highly permeable than when produced on crystalline surfaces was further confirmed by tests on 15-micron iron foils produced from ferrous sulfate baths; deposits on mechanically polished copper had, on the average, a permeability more than three times higher than deposits on etched copper, $k = 10 \times 10^{-7}$ as against $k = 2.8 \times 10^{-7}$.

The same ratio ($k = 7.2 \times 10^{-6}$ and 2.2×10^{-6}) was found with silver deposits, 20 microns thin, produced on bright and on dull iron surfaces and separated therefrom by solution of the base metal in dilute hydrochloric acid. In this case the electrolytic iron foils were produced on mechanically polished copper which was subsequently dissolved in potassium cyanide. This left an iron foil with one side, that facing the polished copper surface, bright, the other side dull and coarsely crystalline. The bright side of the iron foil, a replica of the polished copper, provided the "polished" iron surface. It behaved exactly as if the iron itself had been polished, and the silver deposit produced thereon had a permeability three times greater than the silver deposit made on the dull side of the iron.

In all cases, differences of permeability due to differences of the condition of the base surface tend to vanish as the thickness increases. This is clearly illustrated by the convergence of the four curves for nickel at about 8-micron thickness. It is natural that the range of influence of the base surface should extend only to the first layers of a deposit and disappear in layers increasingly more distant from the base. Notwithstanding that, the original history of the foil, the structure of its very first layers, does make itself felt even at higher thicknesses, where initial permeability has become immeasurably small and where, even if it could be measured, it would show no more differences with different base metal surfaces. There does persist a difference in the rate of corrosion, in the sense that thick deposits produced on a mechanically polished surface, which show a higher permeability in *thin* layers, corrode initially faster than equally thick deposits produced on an etched surface. This is illustrated in Table III and Fig. 2 which give the change of k of 25-micron electrolytic nickel foils (produced on copper surfaces 2 and 3) in atmospheric exposure in Princeton atmosphere.

Further and fuller examples of the direct relation between the rate of the initial corrosion of thick electrodeposits and the initial gas permeability of the same deposits while still thin will be reported in following communications.

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Hazards

(*Continued from page 275*)

traced to the effluents from the industrial plant.

Recently, an episode occurred where some 300 automobiles were spotted by droplets emanating from an exhaust system. Claims are frequently made for damage to gardens, truck farms, trees, and other like items. Whether fictitious or otherwise the damage may be difficult to defend. The only safe procedure is to make positive that the ventilation system is properly designed and engineered and that the air stream emanating from it discharges to a safe place or passes through a suitable filter or collector so that contaminants or collected material cannot go beyond a safe place or beyond the premises of the plant.

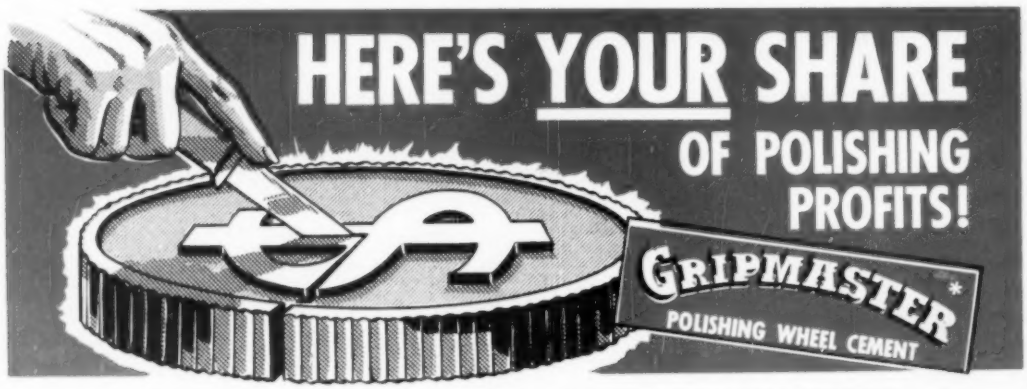
Stream pollution is receiving important civic consideration. The wastes or rinses from cyanide baths and other plating or highly alkaline wash solutions which may contain substantial amounts of suspended solids, chemicals, and oils or greases must be controlled. Such liquid effluents must be treated or neutralized before discharge to a local sewer, a storm drain, or open stream or other points. Fortunately, cyanide and other plating wastes are relatively easy to treat safely. Excellent results have been obtained in most waste-cyanide treating installations, and no difficult has been experienced in the handling of treated wastes by local sewage-treatment plants or in local discharge to streams or other beds. However, it is important that complete records of operation be kept, including interim tests, so that they may be submitted to local authorities as evidence of intent if any question of pollution above permissible quantities should arise.

Conclusion

It is considered safe to state that the electroplating industry has not been singled out as an industry more hazardous than the average of like operations. The injuries which do occur to workers in the electroplating industry are subject to control. The exposure to toxic materials and to industrial disease, while existing, can likewise be controlled.

Control of the exposures in the electroplating industry can be brought about through provision of (a) good equipment and good operating conditions, (b) good housekeeping, and (c) an adequate managerial safety program which will make all workers partners with supervision in the prevention of injuries and occupational disease.

The exposure conditions are controllable; the means for control are handy and well known; the initiative and the continuous application of a control program is the only essential often found lacking.



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Book Review

—DR. HAROLD J. READ, *Associate Professor of Metallurgy, The Pennsylvania State College*

PRINCIPLES OF ELECTROPLATING AND ELECTROFORMING by William Blum and George B. Hogaboom, 3rd edition, 1949, xv + 455 pages. McGraw-Hill Book Company, Inc., 330 W. 42nd Street, New York 18, N. Y. Price, $6.00.

The fact that the second edition of *Blum and Hogaboom* (no one in the profession would ever think of using its formal title) was still serving as an extremely useful reference book 19 years after its appearance in a field marked by great changes and progress in the past two decades is ample evidence of the basic worth and importance of the text. The new edition is, however, none the less welcome, and since it has been brought up to date in every respect, it should serve another entire generation of platers.

The third edition follows quite closely the plan of the second edition except for two notable changes. Procedures for the analysis of plating solutions have been grouped into a single chapter instead of being associated with the discussions of the individual solutions. The descriptions of the methods and processes for plating the various metals have been rearranged from an order based on their apparent importance to a grouping based upon the periodic system. Another minor change is the elimination of the separate chapter on the principles of electrochemistry, and the transfer of the material to the chapter on the principles of chemistry. This change appears to have a pedagogical advantage.

The section on analysis is a gem of succinct writing. In a comparatively few pages the authors not only present a mine of practical information, but they also drive home a great deal of basic analytical chemistry.

Perhaps a word or two concerning the new arrangement of the descriptions of the processes for plating the individual metals may not be amiss. It is pointed out in the preface that by use of the periodic system of the elements, relations between the conditions for plating of different metals can often be predicted. With this in mind, the authors have formed their material into ten chapters, one for each of the sub-groups which contain metals that can be plated. Each chapter opens with a general discussion of the metals in that particular sub-group and continues with sections for the individual treatment of each metal in the sub-group. No objection is seen to this method of presentation, but one is struck by the lack of generalities which can be applied to a sub-group rather than by the relations which might be expected. Either the periodic system is not a very potent tool for the electroplater, or we do not as yet know enough to use it to our distinct advantage.

The descriptions of the individual plating baths for the various metals are not intended to be exhaustive treatments for the guidance of the man in the shop. Such detailed handbook information would have no place in a book devoted to principles. For the man who is seeking information on which bath to select for his particular problem, there is much information of great value, and he will also find ample references to the literature where the details of procedure and bath performance may be found.

The book is noteworthy throughout for its critical presentation of all material. Nothing is taken from the literature without being carefully appraised, and if doubtful aspects are found, they are appropriately treated. There is everywhere in the volume ample evidence of painstaking care in its preparation. Errors of fact and of typography are very difficult to find. There are, of course, places where one might differ with the authors, for example, on page 62 where it is stated that a face-centered cubic lattice structure is composed of units containing 14 atoms. It is true that the simplest crystal unit of this type is usually represented in drawings which show 14 atoms, but the lattice structure is actually made up of a unit cell containing but four atoms, and this is repeated in three directions to form the lattice. Only on points such as this can issue be taken with the authors.

There is not much new material in the sections devoted to electroforming *per se*. This is not an omission on the part of the authors but a simple consequence of the fact that not much new basic information has become available since the last edition. Emphasis is on electrotyping as was the case in the earlier editions. The enforced brevity of the passages on electroforming lend emphasis to the statement that electroforming is a field which suffers from neglect; it might well offer the electroplater an opportunity to diversify his activities.

One is impressed with the thoroughness of the revision even in those parts of the book dealing with matters which have not changed during the past 20 years, such as the chapter on the principles of electricity. Little changes have been made everywhere. They may seem insignificant in themselves, but they add up to a more elegant presentation and an even more readable book. Although the text is somewhat more scientific than the previous editions, as befits the progress of electroplating, the material is presented in such simple terms that any reader should have no difficulty in mastering its contents. There is still every reason to say that *Blum and Hogaboom* is a high-priority item for the library of every electroplater.

The appendix of useful technical data has been enlarged to include a number of new items such as A. S. T. M. specifications and a resume of stripping methods. The name and author indexes were spot checked and found to be both adequate and accurate.

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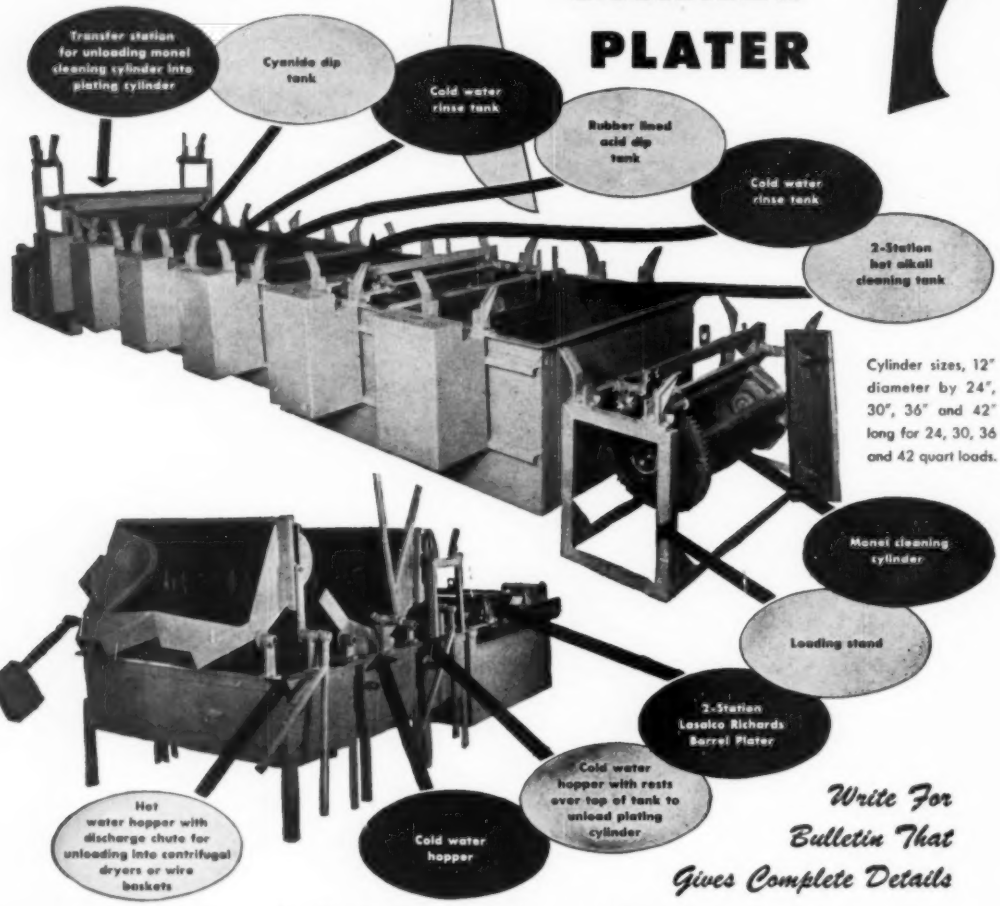
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Rubber lined acid dip tank
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QUESTION BOX

——————readers' questions of general interest——

Q. 77. Is there available any method for anodizing zinc-base diecastings, or any chemical treatment which will serve as a substitute?

A. Anozinc is a series of commercial anodic treatments applied to zinc plate and zinc-base diecastings. Their protective ability is described in a paper by Stareck and Cibulskis in the 1947 A. E. S. Proceedings.

The coatings are not as hard as aluminum oxide and therefore do not have abrasion resistance comparable to anodized aluminum. Yellow anozinc, however, has more wear resistance than clear, and black anozinc is still better. All of them stand up several times longer than some dip coatings and will withstand considerable abuse.—J. E. Stareck.

A. There are several dip processes, such as Ebonol Z, Black Magic, etc., which produce coatings having reasonable abrasion resistance and considerable protective ability. Black nickel plate is quite abrasion resistant and also very protective.—E. A. Anderson.

Q. 78. What is a good cycle for hard-chromium plating on aluminum and its alloys? How should one go about stripping a faulty chromium plate from these alloys?

A. A good plating cycle is (1) clean in carbonate-phosphate cleaner, (2) rinse, (3) dip in 25 per cent sulfuric acid at 180° F for 5 minutes, (4) rinse, (5) dip in 1:1 nitric acid solution at room temperature, (6) rinse, (7) use a zinc immersion treatment at 170° F for 1 minute, (8) double rinse, (9) copper plate for 2 minutes at 24 asf in Rochelle salt copper bath of *p*H 10.2–10.5 at 100–110° F, (10) electroplate in standard chromium bath at 130–140° F at 2 asi.

A faulty chromium plate can be removed satisfactorily by anodic stripping in 15 per cent (by weight) solution of sulfuric acid.—F. Keller.

A. The exact cycle to be used for preparing aluminum for hard-chromium plating depends upon the aluminum alloy. In general the work is cleaned, acid dipped, and then immersed in a sodium zincate solution which activates the aluminum surface and deposits a zinc film. In some cases chromium plating is done directly upon the zinc film, making certain that electrical contact is made prior to entry of the part into the plating bath so that the plating starts immediately. The chromium plating solution tends to remove the zinc film very rapidly and hence ordinary plating without prior contact is not satisfactory. Furthermore, it is difficult to chromium plate irregularly shaped objects when the simple zinc film is applied.

The best procedure in the writer's opinion is to apply either a copper or a nickel plate over the zinc film. These do not necessarily have to be very thick; usually coatings of the order of 0.0001 inch are satisfactory. Nickel is preferred over copper.

Chromium plate can be stripped from aluminum by making the work anode in a chromic acid solution containing from 1 to 2 lb/gal of chromic acid and applying a 6-volt potential.—Walter R. Meyer.

Q. 79. We are able to produce regularly bright deposits, 0.0004 inch thick, of 14-karat gold by plating for about 20 minutes in a gold-copper-nickel cyanide bath but like to improve the structure of the deposit further by PR plating. Can we successfully overcome the selective dissolution of this low-karat gold during the deplating period?

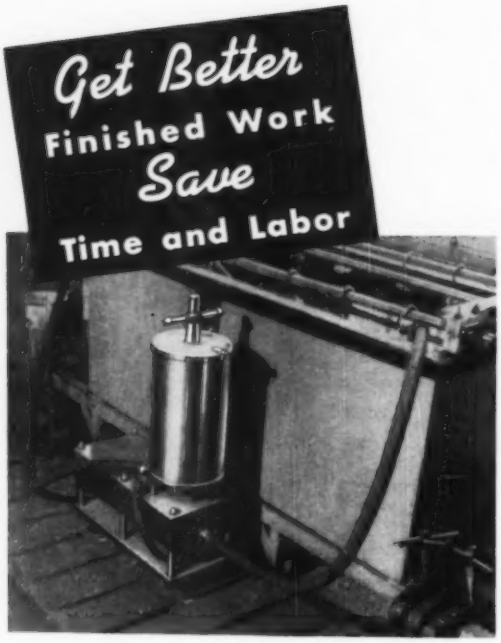
A. We have no experience with ternary gold alloys but have obtained good results with a number of binary alloys. The only way to determine whether PR plating can be used in this application or not is to try it.

The time should be varied from about 3–20 seconds' deplating and from 15–35 seconds' plating. The current density in the reverse direction should also be varied, from a value equal to that used during the plating period to one three times as high.—G. W. Jernstedt.

Q. 80. We manufacture bicycle rims and have been told that someone is using buffs made of fiber glass. Can you tell us about it, including type of buff and compound recommended?

A. Experiments with fiber glass have shown it to be most unsatisfactory, and we know of no practical application at this time.—L. S. Sternal.

A. We have experimented with fiber glass in buffs but found it unsatisfactory; it lacks the absorbent properties so necessary to hold the composition to the wheel. Fiber glass in the shape of a buff has been used to remove solder from tin cases.—E. W. Hall.



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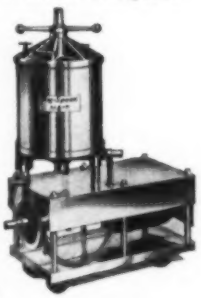

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Patent Abstracts

GEORGE B. HOGABOOM
Consultant, New Britain, Conn.

Copies of patents may be obtained by writing to Commissioner of Patents, Washington 25, D.C. Price 25 cents each.

No. 2,469,237, May 3, 1949, Electrolytic Sealing of Anodized Aluminum Surfaces—James F. Mason and A. H. Beebe, Jr., assignors to Reynolds Metals Company, Inc.

We have now found that effective sealing can be accomplished at temperatures lower than those hitherto believed to be necessary. The advantages of lower temperature processing, particularly from the standpoint of the operator, will be obvious. The quality of the final film produced by our new process is at least as good as that of films produced by the older processes although we have some reason to believe that the film produced by our process may differ in constitution from the films produced by the prior practices . . . The sealed film produced by our process is tough, hard, adherent and impervious. It may be colored by use of any of the conventional dyeing techniques applied to anodized surface prior to application of the sealing treatment.

CLAIM 1. In sealing anodized aluminum surfaces, the improvement which comprises anodically treating the anodized aluminum surface in an aqueous solution of sodium phosphate having a *p*H of about 4.1–5.0 at a temperature of about 65°–85° C with a current density of about 1–2 amperes per square foot of anodized surface until sealed.

CLAIM 2. In sealing anodized aluminum surfaces, the improvement which comprises anodically treating the anodized aluminum surface in an aqueous solution of sodium phosphate having a *p*H of about 4.1–5.0 at a temperature of about 65°–85° C with a current density of 1–2 amperes per square foot of anodized surface for about 15–30 minutes.

2 claims.

References cited: U. S. Patents 2,079,516; 2,126,954; 2,313,755; 2,322,205.

No. 2,485,258, October 18, 1949—Electrodepositing Lead on Copper from a Nitrate Bath—T. S. Chambers and O. C. Slotterbeck, assignors to Standard Oil Development Company.

EXAMPLE 1. Copper sheets . . . were treated for a few minutes with a mixture of one part of nitric acid and three parts of distilled water. The copper sheets were washed and then placed in a solution of lead nitrate containing 100 g/l of lead nitrate and made the anode while a lead or carbon electrode was made the

cathode. Current was passed through the resultant cell for one-half minute at a current density of about 1.55 amp/dm² (14.4 asf). The polarity of the electrodes was then reversed, making the copper sheet the cathode, and current was passed at a current density of about 4.8 amp/dm² (45 asf) for 2 to 3 minutes.

CLAIM. A process for preparing cathodes suitable for electrolytic reduction of organic compounds which comprises electrolytically depositing a thin film of lead weighing between about 0.2 and 0.5 grams per dm² on copper from an aqueous electrolyte consisting essentially of 100 grams per liter of lead nitrate and from 1 to 20 grams per liter of cupric nitrate at a current density of about one ampere per dm² (9 asf).

1 claim.

References cited: U. S. Patents 567,612; 1,306,479; 1,534,709; 1,589,564; 2,048,854; 2,086,841; 2,182,567; 2,451,341. Trans. Kansas Acad. Sci. *45*, 173, 185 (1942). Trans. Electrochem. Soc. *73*, 392 (1938).

No. 2,489,538, November 29, 1949—Electrodeposition of Copper—W. M. Phillips and F. L. Clifton, assignors to General Motors Corporation.

The invention relates to the electrodeposition of copper from acid baths and has for its object the formation of deposits which have a greater degree of smoothness or brilliance than is ordinarily obtained, as well as deposits which are characterized by remarkable "buffability", or capability of being buffed or "colored" by the usual buffing instrumentalities when necessary.

The following may be given as examples merely of baths from which satisfactory results have been obtained:

		Grams
I.	Technical copper sulfate	250
	Cadmium sulfate	35
	Sulfuric acid	10
	Di-chloro-benzene sulfonic acid	10
	Thiourea	0.1
	Water to make	1 liter
II.	Copper sulfate	250
	Nickel phosphate, $Ni_3(PO_4)_2 . 7H_2O$	35
	Sulfuric acid	10
	Phosphoric acid	10
	Naphthylamine	10
	Thiourea	0.1
	Water to make	1 liter
III.	Copper sulfate	250
	Sulfuric acid	10
	Thiourea	0.01
	"Triton 720"	1 ml
	Water to make	1 liter

This produces a semi-bright deposit which is soft and easily buffed.

CLAIM 2. A bath for electrodepositing copper comprising an aqueous acid copper solution comprising essentially copper sulfate and sulfuric acid and having dissolved therein a compound selected from the

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group consisting of cyanamide and dicyanamide, said compound having a concentration in said solution within the range of 0.002 to 5 grams per liter.

4 claims.

References cited: Trans. Electrochem. Soc. **78,** 309-316 (1940). Modern Electroplating (1942), p. 157. Holderman, Thesis (1936), on file at Purdue University, p. 24.

No. 2,490,055, December 6, 1949—Metal Strip Electroplating Apparatus—C. M. Hoff, assignor to National Steel Corporation.

It is an object of the present invention to provide apparatus well adapted for handling stannous tin plating solutions. It is a further object to provide apparatus for handling metal strip at high speed and effecting contact between a plating solution and the strip without excessive aeration of the solution. It is a still further object to provide apparatus which does not involve a radical departure from existing equipment so that such existing equipment can be readily altered to conform to the present invention.

CLAIM 3. A strip plating apparatus comprising a tank for holding a plating solution, having side, end and bottom walls, the side walls extending above the solution level, means for passing a strip across the top of said tank from end to end in a plane substantially coincident with the plane of solution level, said last mentioned means comprising a lower roll located at the exit end with its upper surface substantially tangential to the plane of the solution level, and a cathode contact roll above said lower roll, said rolls being adapted to receive strip there between, the end wall of said tank at the exit end extending upwardly almost to the plane of the strip and being positioned so that the rolls are beyond the said end wall in the direction of motion of said strip, an anode located in said tank below the solution level, electrode connection for said anode and for said contact roll, side-wall extensions extending from the side walls to the rolls and above the plane of the strip, and sealing means extending from said exit-end wall to said lower roll, said sealing means and said rolls together with the extensions of the tank side walls forming a container for holding the plating solution and for restraining its flow from exit end of the tank.

3 claims, 3 figures.

References cited: U. S. Patents 347,959; 929,312; 1,191,386; 1,813,297; 2,061,554; 2,223,860; 2,240,265; 2,244,423; 2,324,652; 2,377,550; 2,384,660; British Patent 467,019. "Electrotinning Steel Strip at Wierton Steel", Metal Finishing 77-79 (February, 1944).

No. 2,490,700, December 6, 1949—Production of Alloy Coating on Base Metal Material—J. S. Nachtman.

I have discovered that in order to produce satisfactory, smooth, homogenous alloy coatings from separate layers it is absolutely necessary to provide proper proportions of alloying metals, to correlate the thick-

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ness of the layers and the time of heat treatment, and to correlate the heat-treating temperatures, particularly starting temperatures, to the melting point of the lowest-melting-point coating metal and to the lowest melting point of the alloy being formed in the coating.

CLAIM 2. In a method of forming a smooth homogenous alloy coating on ferrous-metal base stock, the steps of electroplating at least three layers of at least two alloying metals on the base stock, one of which metals has a melting point above the annealing temperature of the base stock and the other of which metals has a melting temperature below the annealing temperature of the base stock, then heat treating the thus plated metals to start diffusion of the same by subjecting the plated stock under nonoxidizing conditions to an initial temperature below the melting point of the lowest-melting-point metal and then gradually increasing the heat treating temperature to the higher point above the melting point of the lowest-melting-point coating metal to the point of complete diffusion between the metal layers and to a temperature sufficient to anneal the base stock but maintaining the temperature below the melting point of the alloy formed.

2 claims, 7 figures.

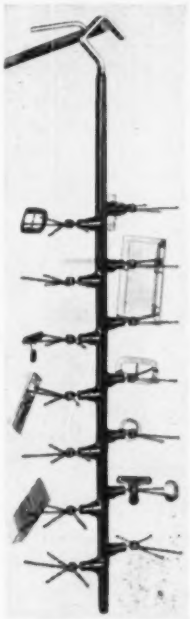
References cited: U. S. Patents 1,364,051; 1,547,394; 1,578,254; 1,820,204; 2,196,002; 2,304,709; 2,315,740; 2,428,033; 2,428,318.

No. 2,490,084, December 6, 1949—Method of Controlling Flow Brightening of Plated Metal Articles—H. P. Munger, assignor to Republic Steel Corporation.

CLAIM 12. The method of flow brightening electrodeposited tin on tinplate which comprises moving tinplate edgewise, inductively heating the tin on a portion of moving tinplate to its melting temperature, directing a first light beam onto said portion of the tinplate where the tin is to be unmelted, directing a second light beam onto said portion where tin is to be molten, picking up light reflected from said beams by said tinplate by separate means sensitive to differences in light reflected by melted and by unmelted tin, converting such picked up light into electric currents having values which are functions of the reflecting properties of melted and unmelted tin, utilizing the difference in current which occurs when first said light beam is reflected by molten tin to actuate reversible current-controlling means to decrease the rate of heating the tin and utilizing the difference in current which occurs when the second said light beam is reflected by unmelted tin to actuate reversible-current controlling means to increase the rate of heating of the tin.

12 claims, 7 figures.

References cited: U. S. Patents 1,165,037; 1,377,574; 1,876,745; 1,937,420; 2,085,543; 2,089,014; 2,089,145; 2,089,029; 2,128,406; 2,162,292; 2,205,512; 2,312,310; 2,329,188; 2,357,126. Austrian Patent 107,282.



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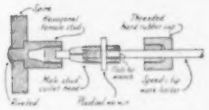

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1—2500 A. Gen. Elec.
2—3000 A. Electric Products
1— 600 A., 24 V. Reliance
1— 200 A., 25 V. Star
1— 300 A., 25 V. Star
1— 175 A., 25 V. Cr. Wh.

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1— 200 A., 30 V. West.
2— 800 A., 32 V. Gen. Elec.
2—1500 A., 32/40 V. Century
1—1000 A., 33 V. Gen. Elec.
2— 500 A., 40 V. Chandeysson
2—1000 A., 40 V. Chandeysson
2— 200 A., 48 V. Gen. Elec.
3—1500 A., 45 V. Century
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Your plating pal,
Bill

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No. 2,491,839, December 20, 1949—Process for Electroplating a Sintered Ferrous Article—R. B. Tinker, assignor to General Electric Company.

CLAIM 1. The process for electroplating a sintered ferrous article containing a multitude of microscopic pores on its surface thereby to obtain a metallic coating free of a pitted "sinking" effect, which process consists essentially of (1) surface grinding the sintered ferrous article, (2) immersing said sintered article in the absence of an electric current so as to impregnate it in a heated 0.5 to 30 per cent aqueous alkaline solution maintained at around its boiling point thereby to occlude small amounts of the alkaline solution within the pores of the sintered article, (3) removing the article and washing with water, (4) immersing the washed article in and subjecting it to the action of an acid cleaning solution, (5) removing the article from the acid cleaning solution and electrolytically depositing a chromium coating on the surface of the cleaned article using an acid electroplating bath, (6) removing the electroplated article and rinsing with water, (7) immersing the article again in the aforementioned alkaline solution to neutralize any acid remaining on the surface of the plated article, and (8) rinsing the article with water and drying it.

CLAIM 2. The process as in Claim 1 wherein the aqueous alkaline solution employed in step (2) for impregnating the pores of the sintered article comprises, by weight, from about 1 to 8 parts of the alkaline material in 100 parts of water solvent.

CLAIM 3. . . . comprises an aqueous sodium carbonate solution containing, by weight, from 1 to 8 parts of sodium carbonate per 100 parts of water solvent.

3 claims.

References cited: U. S. Patents 1,878,837; 2,028,312 2,323,162. Chem. & Met. Eng. 166 (December, 1942). "Modern Electroplating" (1942), pp. 120, 131, 132, 134. Met. Ind., Electrometallurgy Suppl. 299–300 (May 12, 1944).

No. 2,491,925, December 20, 1949—Apparatus for Electroplating—A. Lazaro.

CLAIM 1. In a selfcontained portable electroplating barrel unit, the combination of a supporting frame comprising longitudinal and transverse metal frame members secured together to provide a rectangular frame with the longitudinal frame members projecting longitudinally therefrom, a driving motor carried above and by said frame, a transverse drive shaft carried by said frame and connected by a speed-reducing gearing to the shaft of said motor, said drive shaft carrying a driving gear constructed of chemically inert initially plastic material, a pair of depending bearing brackets carried by said frame and extending parallel to each other, an electroplating barrel consisting of a pair of thick end plates, said end plates being grooved on their inner opposing sides and said groove being of substantially the shape of a polygon, a single-sheet side wall for said barrel which is bent under the influence of heat at a plurality of obtuse angles, said angles being equally spaced from each other to form a regular polygon with the side edges of said body plate shaped to fit in said grooves, means for rotatably supporting said end plates on depending bearing plates, said end plates, bearing plates and latter means being formed with an axial aperture at each end of the barrel, an insulated conductor secured to said depending plates and extending through said aperture at each end of the barrel and provided at its end with a metallic head which is socketed to receive the insulation of said conductor, a gear carried by one of said end plates and meshing in firstmentioned gear, said latter gears, depending plates and barrel all being made of said initially plastic chemically inert material and the ends of said barrel being integrally welded to the side edges of said body plate, a pair of hook-shaped members of electrical conducting material carried by said depending plates and electrically connected to said insulated conductors for simultaneously supporting the unit on a bus bar, and connecting the conductors and metallic members inside the barrel to one terminal of a source of direct current.

2 claims, 6 figures.

References cited: U. S. Patents 1,207,283; 1,251,568; 1,276,649; 1,823,465; 1,848,391; 1,199,796; 2,006,519; 2,035,633; 2,120,478; 2,189,955; 2,243,728; 2,249,609; 2,293,978. British Patent 110,248. Australian Patent 114,557.

No. 2,493,579, January 3, 1950—Solution for Anodic Polishing of Steel and Iron Articles—M. B. Hammond and G. B. Bowman, assignors to Standard Steel Spring Company, Coraopolis, Pa.

In accordance with our invention we include, in a bath which consists principally of phosphoric acid, sodium sulfate or other alkali-metal or ammonium sulfate in such amount as to react with the iron in solution and precipitate it and maintain the concentration of iron metal in solution below one ounce per gallon.

CLAIM 7. A solution for use in the electropolishing of steel and iron articles wherein the article is employed as an anode, said solution consisting essentially of and containing by weight 55 to 85 per cent phosphoric acid, 0.1 to 4 per cent sulfuric acid, 7 to 30 per cent water, 1 to 15 per cent of a member of the class consisting of tri-alkali metal phosphate, di-alkali metal phosphate, mono-alkali metal phosphate and phosphorus pentoxide, 0.1 to 5 per cent of flocculating agent for iron sulfate, and at least 0.5 per cent of a sulfate of the class consisting of alkali metal sulfate and ammonium sulfate.

7 claims.

References cited: U. S. Patent 2,330,170. British Patents 521,290; 547,592; 556,797. Iron Age, May 30, 1940, pp. 26–30. Proc. Am. Electroplaters' Soc. **29**, 109–110 (1941).

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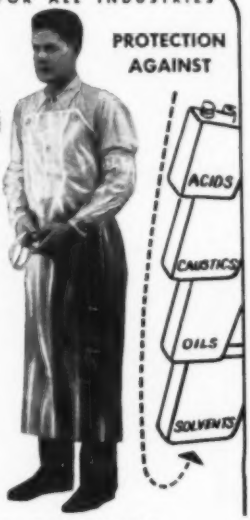

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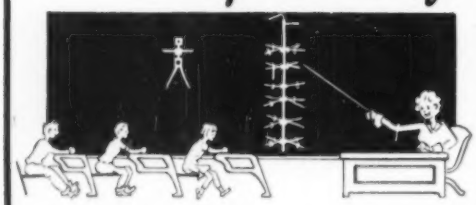

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Article Abstracts

For copies of original articles, turn to your Public Library for photostats or addresses of the publications in question

Cathodic Polarization in Zincate Electrolytes. N. T. Kubryavtsev. J. Phys. Chem., U. S. S. R. 23, 849-857 (July, 1949).

Cathodic polarization denotes the character of the cathodic process in electrolytic deposition of metals. The structure of electrolytic deposits—size, form, and orientation of the crystals—is often determined by the rate and degree of variation of the cathodic polarization with the current density. A higher polarization of the electrode increases the probability for the formation of new crystal nuclei on the energetic, less-active parts of the electrode surface. An increased number of crystal nuclei leads to the formation of a fine-grained structure. Tests are described in which the cathodic polarization in zincate electrolytes was measured by means of an ordinary compensation method and by the method introduced by A. T. Vagramyan (rapid evaluation of the polarization curves) the results of which correspond. The Vagrammyan method enables evaluation of the polarization curves in a greater interval of the current density without special complications in a much shorter time and offers a good analysis of the results. The observed rate of polarization of zincate solutions depends upon the speed of measurement. Only a small part of the polarization in zincate solutions can be attributed to chemical polarization. The evaluation of anodic and cathodic polarization curves shows that the rate of ionization of zinc in zincate solutions is much higher than the rate of discharge of the ions. Cathodic polarization increases with the current density faster than the anodic polarization.

Salt-Bath Chromizing. I. E. Campbell, V. D. Barth, R. F. Hoeckelman, and B. W. Gonser. Iron Age 163, 71-72 (May 26, 1949).

Chromizing by immersion of ferrous metals in fused-salts baths containing 5-30 per cent chromous chloride was found to compare favorably with conventional pack methods both in overall cost and in rate of case formation.

State of the Surface and Properties of Electrodeposits. A. Glazunov and L. Jeniek. "Journees des Etats de Surface" (1946), pp.85-89.

Establishes the influence of the state of surface on the corrosion-preventive properties of electrodeposited layers. It is indicated that, beside the conditions of the electrodeposition, it is one of the main factors.

"Epitaxis" in Electrodeposits. Georges A. Homes and Marcel Maquestiau. "Journees des Etats de Surface" (1946), pp. 90-91.

"Epitaxis" refers to the mechanism by which a con-

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tinuous crystalline structure, on an atomic scale, can be formed, joining the base metal and the electrodeposit to produce in maximum adherence. The laws of "epitaxis" and the influence of vatious factors on the deposition of copper on mono- and polycrystalline iron were investigated.

Porosity in Metal Coatings. Formation and Assessment: Note on Work in Prpgress at B. I. S. R. A. J. Pearson. Electroplating and Metal Finishing 2, 102–106 (February, 1949).
Discusses causes of porosity, pore-counting methods, methods for determining pore area, and relationship of pore count to weight of tinplate coatings. Outlines a new method for determination of porosity by cathodic suppression of solution. It was found that, if the current required to suppress corrosion in a suitable solution is plotted against electrode potential, a break in the curve occurs at a value of the suppression current which has a deqnite relationship to the results of the thiocyanate test.

Determination of Surface Roughness by Use of Longitudinal Feelers and by Interference Techniques. F. Flamant and M. A. Arnulf. "Journees des Etats de Surface" (1946), pp. 110–116.
Reviews different methods and indicates application of individual methods to different surfaces, simple machining, grinding, mechanically or electrolytically polishing, etc. A series of photomicrographs and graphs to illustrate the article.

Investigation of Ceramic, Graphite, and Chrome-Plated Graphite Nozzles on Rocket Engine. George R. Kinney and William G. Lidman. National Advisory Committee for Aeronautics, Research Memorandum E8L16, March 7, 1949, 17 pp.
Presents results of a brief investigation of use of ceramic material for rocket nozzles and the effectiveness in preventing oxidation and erosion of graphite nozzles by chromium plating the internal surface. The investigation was conducted on a 1000-lb-thrust acid-aniline rocket. Estimated combustion-gas temperatures were 2000–2400° F. A ceramic, which contained a high percen°age of sillimanite, was investigated in the form of a thin-wall nozzle backed with plaster of paris. A thin chromium plating on the internal surface of graphite nozzles was effective in preventing oxidation and erosion.

The Concept of Organic Coating Hardness. M. H. Switzer. A. S. T. M. Bulletin 67–70 (January, 1949).
Describes development of concepts which have resulted from the activities of the Group on Hardness of Organic Coating Films of Subcommittee XVIII on Physical Properties of Materials of A. S. T. M. Committee D-1 on Paint, Varnish, Lacquer, and Related Products.

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Adhesion of Polythene to Metal. C. E. Richards and R. L. Bull. J. Soc. Chem. Ind. **68**, 19–22 (January, 1949).
Describes two methods of coating metals with polythene: use of polyisobutylene soaked in a polymerizable compound which is subsequently polymerized in situ and use of molten polythene on a previously prepared lead surface. Results are tabulated.

Applying Industrial Finishes. G. J. Cavanaugh. Steel **124**, 106–108 (March 21, 1949).
Choice of organic material to be used on metal products depends on many factors. Some of these, such as size, shape, and service use, are discussed in relation to consumption of materials and methods of application.

Cadmium Recovery Practice at the Donora Zinc Works. G. T. Smith and R. C. Moyer. Metals 1, sec. 3 (Metal Trans. **185**), 360–362 (June, 1949).
Production procedure is divided into the following steps which are discussed separately: raw materials, sulfating, purification, precipitation, briquetting, smelting, remelting, and recovery of rare metals.

Comparison of the Most Important Methods for Surface-Finish Control. G. Michalet. "Journees des Etats de Surface" (1946), pp. 124–134.
Systematically analyzes different methods and equipment used for the determination of the roughness of surface and degree of polishing. Schematic drawings of equipment are presented; methods of their application are described. 17 ref.

Suggestions Concerning Use of Correlation Charts for Intepretation of Surface-Finish Records. J. R. Womersley and M. R. Hopkins "Journees des Etats de Surface" (1946), pp. 135–139.
Indicates that the profilogram obtained by apparatus with feelers does not define completely the condition of the surface. Shows that only by meticulous analysis of a series of profilograms compiled into correlating chart the true surface condition may be determined.

Plating Easily Buffed Nickel: The PerflowProcess. T. S. Blair. Iron Age **163**, 86–89 (June 16, 1949).
Describes process for deposition of a soft semibright nickel that fills in surface irregularities during plating and color buffs easily. It has provided substantial savings and increased production in the plating department of the plant described. Surface preparation is less critical, plating time has been reduced, and buffing capacity has been stepped up 25 per cent.

Hard Chrome Plating Milling Machine Quills. Warren Schmidt. Iron Age **163**, 96–97 (June 16, 1949).
Gives complete cost breakdown, enabling determination of a cost-per-sq.in figure, and a description of the plating process for the above, which is typical of applications to rebuilding of worn machine parts.

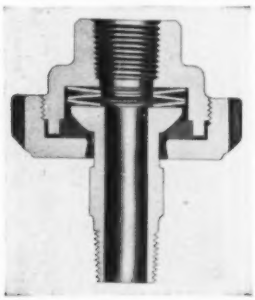
Equipment and Supplies

E—428. Plating Anode Rod Support—Made of nonferrous metal completely covered with a tough semi-hard rubber, the new anode rod support manufactured by Automotive Rubber Company, Inc., 8601 Epworth Boulevard, Detroit 4, Mich., is said to be self-aligning and unbreakable. The pin of the support sets in a single hole provided in the tank flange which allows pivoting to compensate for misalignment. It will take anode rods up to 4-inch in diameter. For further information, use Reader Service Card.

E—429. Tumbling Machine—A new tumbling machine has been announced by Lupomatic Industries, Inc., 4510 Bullard Avenue, New York 66, N. Y. It is designed to handle such Tumb-L-Matic processes as deburring, definning, cutting, smoothing and polishing.

One of the main improvements over former models is the mounting of the bearings on the raised frame for positive support to drive mechanism. Ball-bearing-equipped throughout, the shaft housings are now supported by the frame itself. Chain-gear drive with constant-speed motor assures steady power at all times. When a change of work calls for a different speed the unit can be readily converted. For further information, use Reader Service Card.

E—430. Swivel Pipe Joint—The Barco Manufacturing Company, Dept. 108, 1801 W. Winnemac, Chicago 40, Ill., has announced a new swivel pipe joint for swivel and slow-revolving applications



which is available in 90° angle and straight designs in $\frac{3}{8}$–1 inch pipe sizes.

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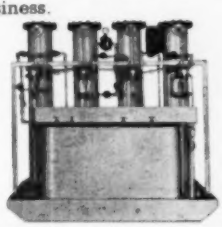

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Equipment and Supplies

tumbling-barrel machine suited for burnishing, tumbling, sawdust drying, deburring, or plating of jewelry or similar small items has been introduced by J. Szeremany, 58 Lexington Avenue, Maplewood, N. J.

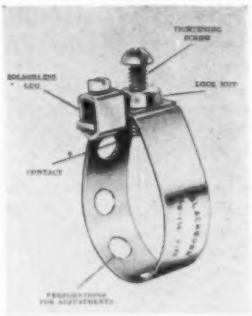
The unit permits interchanging of barrels for the specific type of operation desired. Both steel and wood barrels are available in 10- and 14-inch base-diameter sizes. Three speeds are obtained by cone pulley drive. The unit occupies 14 x 18-inch bench space. For further information, use Reader Service Card.

E—432. Pure Ion Exchange Resins for Research—To meet the exacting requirements of laboratory workers in research and analytical studies, the standard Amberlite ion-exchange resins are now being produced in a cp form by the Resinous Products Division of Rohm & Haas Company, Washington Square, Philadelphia 5, Pa. They are supplied exclusively, in quantities less than 25 pounds, through Eimer & Amend of New York and Fisher Scientific Company of Pittsburgh and St. Louis. The manufacturer emphasizes that it is not necessary or economical to employ the purified resins in commercial applications.

Resin grades available are: Amberlites IR-100 and IR-105, strongly acidic cation exchangers of the sulfonic acid type, effective in the *p*H range 4–8.5; the weakly acidic, carboxylic acid type cation exchanger IRC-50, with a *p*H range of 6–14; the weakly basic anion exchanger, IR-4B, the range of which extends from *p*H 1–7; and IRA-400, a strongly basic anion exchanger, operable over a *p*H range of 1–10. Amberlite XE-81, a purified mixture of a strongly basic anion-exchange resin and a strongly acidic cation-exchange resin is operable over a *p*H range of 0–14 and permits the deionization of solutions by the "mixed bed" method. For further information, use Reader Service Card.

E—433. Adjustable Ground Clamp—Blackburn Specialty Company, 6541 Euclid Avenue, Cleveland 3, Ohio offers an Adjustable Ground Clamp in two sizes, one to fit 3/8- to 1¼-inch pipe and the other 3/8- to 3-inch pipe. A tightening screw chafes the pipe, draws up slack, cuts through rust and dirt, and at the same time contracts band around the pipe surface assuring a perfect ground.

Solder or solderless terminal types are available for low or high amperage grounding of electrical equipment, conduits, armored cable, etc. For further information, use Reader Service Card.



E—434. Rust Preventive Coating—The International Rustproof Corporation, 12507 Plover Avenue, Cleveland, Ohio, has placed on the market a rust preventive for use on aluminum, chromium, ferrous or nonferrous metals. The product, known as Rustarest No. 30, provides a coating over plated or bare metal and, although hard and tough, is pliable enough to take bending or curving.

The manufacturer states that it is a clear, transparent coating that dries quickly without baking. When used as a primer, it prevents paint from chipping off. For further information, use Reader Service Card.

E—435. Work Gloves—The Edmont Neox-coated Work Glove, which its makers claim regularly to outwear 3–9 pairs of ordinary work gloves, is now furnished with fingers and thumbs molded

to their natural position and curvature and with a much wider span between thumb and first finger. These design improvements are said to give the wearer greater comfort and firmer, surer grip, reducing hand fatigue. The gloves are available in knit-wrist as well as gauntlet style. For further information, use Reader Service Card.

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99.75% PURE
POTASSIUM BICHROMATE
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MUTUAL CHEMICAL CO. OF AMERICA
SINCE 1845 MUTUAL CHEMICAL COMPANY OF AMERICA
270 Madison Avenue, New York 16, N. Y.

A. E. S. News

A. E. S. Founder Members to be Honored Information Wanted!

It is planned to honor the Founder Members of the American Electroplaters' Society at the Annual Convention in Boston on June 12–15, 1950.

Before plans can be completed and announced, it is desired to learn whether any of the early members of the National Electroplaters' Association in 1909 and the American Electroplaters' Society in 1913 listed below are still living and, if so, where they may be reached.

Theodore Bartlett	F. J. Frost
William Bryer	Louis Gaenicke
W. E. Churchill	John E. Grant
Fred C. Clement	A. D. Havens
H. W. Cummings	J. F. Hubbs
E. B. Davidson	J. M. Kerhart
Otto Deenowitz	James Meldrum
R. Downey	Wm. McConnell
C. Dreher	L. A. Peterson
Frank Duffy	Franklin Sheldon
Fred Eberwein	George Whalen
C. O. Field	E. D. Van Arsdale
Wm. G. French	J. F. Meinke
C. D. White	G. W. Cooper

Readers having information about any of these or other early members are requested to send it to the Executive Secretary, American Electroplaters' Society, P. O. Box 168, Jenkintown, Pa.

Sustaining Membership Drive

All Branches that have appointed Research Committee representatives have now received through their Research Finance Chairman a "package" containing the slide film and sound record entitled "Lot's Wife", as well as information about machines required for showings and where they are available.

It is hoped that the Branches will make best possible use of this material in selling A. E. S. Research, not only to Branch members but above all to the officials of companies who have the say-so about becoming sustaining members.

Officials Back A. E. S. Research

The drive by the Detroit Branch for new sustaining members and especially for industry support of A. E. S. Research Project No. 10 on "Disposal of Plating Room Waste" has received strong support from Detroit Board of Commerce and the Department of Conservation of the State of Michigan.

In a letter to W. B. Knight, Detroit Branch Finance Chairman, Harry Richard, Manager of the Industrial Department, states, "The Detroit Board of Commerce is cognizant of the activities of the Research Committee of the American Electroplaters' Society and deems these efforts of the greatest value to the metal working industry. We are particularly in accord with your Project No. 10 . . . The . . . Research Program merits consideration of all industry concerned . . . "

P. J. Hoffmaster, Director of the Department of Conservation, writes, "I am much pleased to learn of the activities of your Society. Just as *Project No. 10 is a must for your welfare* so will it be a boon to the people . . . I wish you every success and if we can help in pushing it along, please let us know."

Los Angeles Branch Members Show Plating on Television

Three members of the Los Angeles Branch joined cover girl Diana Daley and master of ceremonies Gil Martin in the January 8 American Chemical Society television show, "Science Page", in Los Angeles.

The subject was "The Electroplating Chemist". Harold J. Kroesche began by showing typical parts being plated, the variety of metals used for plating, slide pictures of a fullautomatic plating machine, and how polishing and buffing is being done. Emmette R. Holman, Chief Chemist of Turco Products, Inc., then proceeded to demonstrate various cleaning methods, after which Leon Kadison, Electrochemist of Crown City Plating Works, showed the actual plating operations.

Very favorable response was indicated, both from the industry and the general public, according to our informant. The plating industry and, through a special plug, the A. E. S. Los Angeles Convention in 1951 got a good boost.

A film, "not too good", was taken of the program by Turco Products, Inc., and will be made available through its local Managers to those Branches who desire it for a showing.

Electroplating Publicity

The first of a series of articles publicizing the electroplating industry, one dealing with "Car Bumpers", appeared in the February issue of "Motor News".

This, and the articles which are to follow, has been written by S. E. Sangster under the auspices of the Special Committee to the Executive Board of the Society, of which W. M. Phillips is chairman.

Mr. Sangster, who attended Toronto University for two years, has spent his life in public relations, editing, and freelance writing. He has handled publicity campaigns for such bodies as the National Foreign Trade Council, The Association of National Advertisers, Detroit Wholesale Merchants Association, Advertising Federation of America, and the National Retail Merchants Association, as well as for a number of large corporations.

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CUTTING, CUT AND COLOR AND MIRROR-FINISHING COMPOUNDS

EASY WASH, **in cake and dip form**

QUALITY—PRICE—SERVICE

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INDICATE A 210.

A. E. S. ANNUAL CONVENTION

BOSTON, JUNE 12-15

TIME FOR RESERVATIONS

Members and friends of the American Electroplaters' Society will soon receive from the Boston Hotel Reservations Committee through W. L. Larsson, Chairman, a letter inviting early reservations for the A. E. S. Convention. With it is a reservation card, as shown to the right, referring to the A. E. S. Convention and addressed to Mr. D. B. Stanbro, Hotel Statler, Boston 17, Mass.

Mr. Larsson writes:

"Registration will begin Sunday afternoon, June 11. Please check in then.

"Our ambition is to house the Convention all under one roof, namely, the Statler's. This can be done only with your cooperation; so will you fill out the enclosed reservations card and return it right away? That will help a lot.

"In reserving rooms please give (1) names of all persons to whom the rooms are to be assigned, (2) the days of arrival and expected departure, (3) the expected time of arrival, which will speed up your registering, and (4) your name and address for Statler's confirmation.

"If you want reservations in a hotel other than the Statler, please make that fact known to the Reservations Committee as soon as possible.

"All reservations for rooms must be in our hands **not later** than May 24, 1950."

Please reserve accommodations as checked (√) below:

Postage required when mailed from Canada

Name .....
(Please Print)

Address .....

City ..... State .....

Unless requested otherwise, we will hold your reservation until 6 p.m. of the day of your arrival.

Date Arriving ..... Hour .... A.M. P.M.

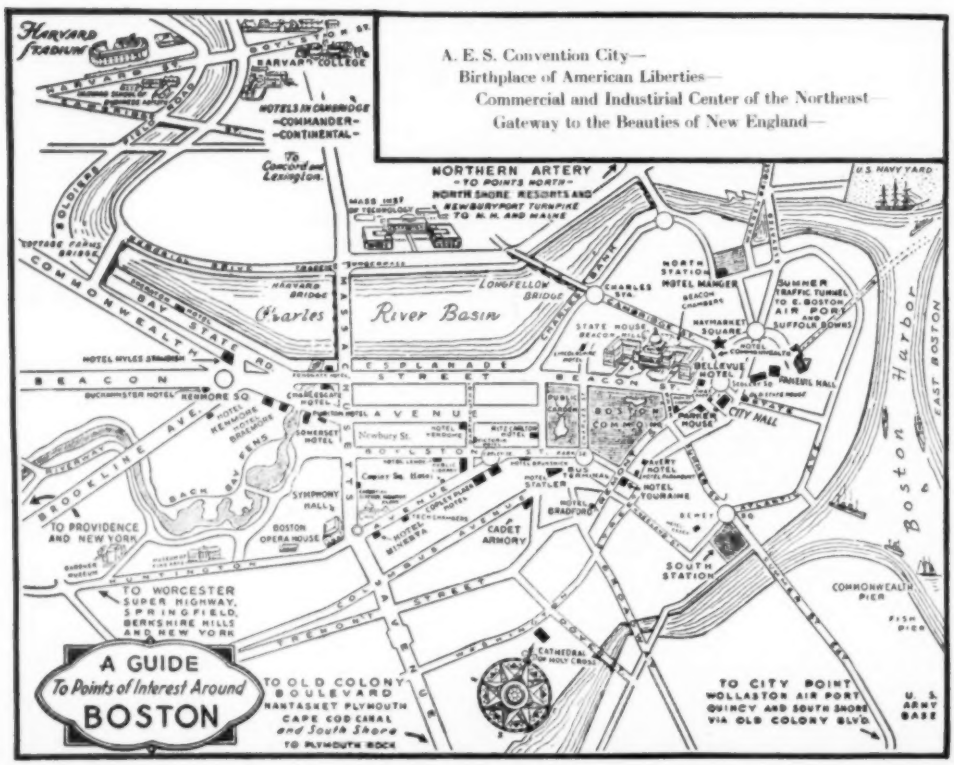
Date Departing ..... Hour .... A.M. P.M.

Room and Bath For One—Per Day	4.50 ☐	5.50 ☐	6.50 ☐
	4.75 ☐	6.00 ☐	7.00 ☐
	5.00 ☐	6.25 ☐	8.00 ☐
			10.00 ☐
Double-Bed Room with Bath For Two—Per Day	8.00 ☐	9.00 ☐	10.50 ☐
	8.50 ☐	9.50 ☐	12.50 ☐
	8.75 ☐		
Twin-Bed Room with Bath For Two—Per Day	10.00 ☐	11.50 ☐	15.00 ☐
	10.50 ☐	13.00 ☐	16.00 ☐
	11.00 ☐		

More than Two Persons in One Room
For each additional person in Double or Twin-Bed Room the extra charge is $2.50 per day.

SUITE—Living Room, Bed Room and Bath
For One 17.00, 18.00, 21.50, 23.00
For Two 20.00, 21.00, 22.00, 24.50, 28.00

If a room at the rate requested is unavailable, one at the nearest available rate will be reserved.



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For Strong Acid Solutions,
Acid Copper, Acid Zinc,
Low pH Bright Nickel,
Fluoborates

Bags for Standard Elliptic

24″ Anodes	$1.00 each
30″ Anodes	$1.20 each
36″ Anodes	$1.35 each
40″ Anodes	$1.47 each

Nyl-Eon

ANODE BAGS

For Alkaline and Nickel Solutions

Cyanide Copper	Brite Copper
Cyanide Zinc	Brite Zinc
Watt Nickel	Brite Nickels
Silver Tin	Brass

Bags for Standard Elliptic

24″ Anodes	60c each
30″ Anodes	67½c each
36″ Anodes	75c each
40″ Anodes	80c each

Robins' all nylon anode bags made of TOUGH du Pont chemically resistant nylon offer important advantages:

☆ **TEAR RESISTANT**
3 to 4 times tensile strength and elasticity of cotton

☆ **HEAT RESISTANT**
continuous service up to 300° F.

☆ **EASILY CLEANED**

☆ **NON ABSORBENT**

☆ **CHEMICALLY RESISTANT**
Unaffected by alkalies

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Branch News

BALTIMORE-WASHINGTON BRANCH

The January meeting was a special occasion, a joint meeting with the recently formed Washington Section of the Electrochemical Society. It was held on the 19th at the National Bureau of Standards. In spite of bad weather, sixty members and guests attended.

The speaker of the evening was Dr. Leon F. Curtiss, Chief of the Neutron Measurement Section of the National Bureau of Standards, who talked about "Radioactivity and Some of Its Applications". Dr. Curtiss discussed, in a clear and interesting manner, the nature of radioactivity and methods for making quantitative measurements of its intensity. He also described how radioactive isotopes are made in the uranium pile and with the cyclotron and pointed out some of the applications of common radioisotopes.

Following Dr. Curtiss' presentation Fielding Ogburn, President of the Branch, pointed out some applications of radioactivity to problems in electroplating, and Mr. Ogburn and Dr. Abner Brenner carried out a demonstration of plating of radioactive cobalt. Refreshments were served after the meeting.

Vernon A. Lamb, *Secretary*

BOSTON BRANCH

The Branch met on December 1 in Hotel Statler with President Louis V. Gagnon in the chair. Two applicants for membership were accepted. Convention Chairman Manson Glover reported for his committee. The Secretary was authorized to purchase a 3¼ by 4 inch slide projector.

After the secretary had shown colored slides of Boston members at the Milwaukee Convention, Mr. Ray O'Connor of Contract Plating Company, Stratford, Conn., discussed "Cost Systems for Plating". Work sheets were shown of the splitup of expenses to give a selling price based on factory cost, selling and administration expense, plus a standard profit. Factory-expense charges were broken down into separate units including indirect labor, indirect materials, indirect expenses, and distributed charges. Variations in manufacturing expenses were treated and the use of the "profitgraph" explained together with monthly profit-and-loss statements and cost of deposition material. A lengthy discussion period ended this joint meeting with the Master Metal Finishers Association of New England, Inc., which may be the forerunner of similar joint meetings with this and other societies.

George P. Swift, *Secretary*

AVAILABLE FOR IMMEDIATE SHIPMENT ATTRACTIVE VALUES

THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS AND RECTIFIERS, WITH FULL CONTROL EQUIPMENT:

1—15,000/7500 AMPERE, 6/12 VOLT **COLUMBIA ELECTRIC CO.** with Separate M. G. Exciter.

1—10,000/5000 AMPERE, 8/16 VOLT **ELECTRIC PRODUCTS CO.** Separately Excited. Synchronous Motor. Excellent Condition.

1—10,000/5000 AMPERE, 6/12 VOLT **HANSON-VAN WINKLE-MUNNING CO.** Separately Excited. Synchronous Motor. Excellent Condition.

2—7500/3750 AMPERE, 8/16 VOLT **HANSON-VAN WINKLE-MUNNING CO.** Separately Excited. Synchronous Motor.

1—6000/3000 AMPERE, 6/12 VOLT **HANSON-VAN WINKLE-MUNNING CO.** Separately Excited. Synchronous Motor.

1—5000/2500 AMPERE, 6/12 VOLT **MUNNING** "OPTIMUS." Separately Excited.

1—3000/1500 AMPERE, 6/12 VOLT **CHANDEYSSON ELECTRIC CO.** Synchronous Motor. Exciter in Head.

1—3000/1500 AMPERE, 6/12 VOLT **ELECTRIC PRODUCTS CO.** Synchronous Motor. Separately Excited.

1—2000/1000 AMPERE, 12/24 VOLT **HANSON-VAN WINKLE-MUNNING.** Separately Excited.

1—2000/1000 AMPERE, 6/12 VOLT **HANSON-VAN WINKLE-MUNNING.** Separately Excited.

1—1500/750 AMPERE, 6/12 VOLT **HANSON-VAN WINKLE-MUNNING.** Shunt Wound. Separately Excited.

2—1000/500 AMPERE, 6/12 VOLT **CHARLES J. BOGUE ELECTRIC CO.** Separately Excited. Interpole Design. Exciter-in-Head.

1—1500 AMPERE, 40 VOLT **HANSON-VAN WINKLE-MUNNING** Anodizing Synchronous MG Set. Automatic Controls. Exciter-in-Head.

1—1000 AMPERE, 40 VOLT **HANSON-VAN WINKLE-MUNNING CO.** Anodizing Synchronous M. G. Set. Exciter-in-Head.

1—1000 AMPERE, 25 VOLT **HANSON-VAN WINKLE-MUNNING CO.** Separately Excited. Anodizing Unit.

OTHER SIZES OF ELECTROPLATING AND ANODIZING MOTOR GENERATOR SETS IN STOCK.

4—**G. E.** COPPER OXIDE RECTIFIER, 500 AMPERES, 6 VOLTS, for operation on 220/3/60.

1—2000 AMPERE, 6 VOLT, **GENERAL ELECTRIC CO.** COPPER OXIDE RECTIFIER for 220 volt, 3 phase, 60 cycle input.

2—1440/720 AMPERE, 6/12 VOLT **UDYLITE-MALLORY** RECTIFIERS, for 220/440 volt, 3 phase, 60 cycle input.

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INDICATE A 214.
INDICATE A 215.

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BRIDGEPORT BRANCH

The Open Meeting and Educational Session on November 18 drew fifty-five members and guests. RAY GORAL presided as Technical Chairman and introduced MR. FRED KELLER, Chief of Metallography Division, Research Laboratories, Aluminum Company of America, New Kensington, Pa., who chose for his topic, "Conditioning of the Aluminum Alloys for Electroplating".

Mr. Keller began by commenting on the expansion of the finishing industry since he last visited Bridgeport and how modern it looked in comparison.

In his talk he stressed that the zinc immersion treatment of aluminum was very necessary prior to plating and that with it very good plated coatings are being obtained. Slides were shown illustrating the different immersion time required for different aluminum alloys. Salt-spray-test values for properly plated aluminum were very high. Chromium over nickel deposits on aluminum alloys has proved important in prolonging the life in salt-spray tests. Samples of work were shown.

The session proved most interesting and led to considerable discussion.

JOSEPH G. STERLING,
Secretary-Treasurer

BRIDGEPORT BRANCH

A Business Meeting and Ladies' Night was held December 2 with twenty-eight men and nine ladies present.

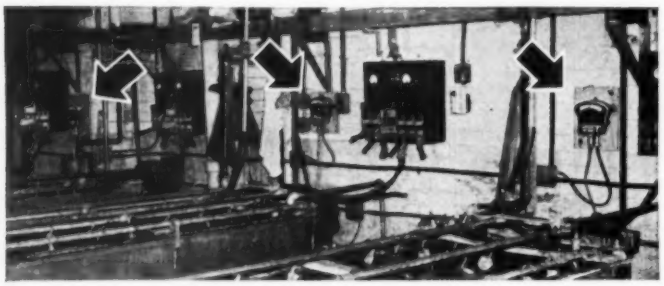
One applicant was elected to membership, and one application was received. There was one transfer to the Chicago Branch.

After WILLIAM A. EHRENCRONA had explained the "Old Timers' Night" tradition and AXEL BOGGILD had spoken about the importance of good metal finishing on the products that the ladies desire in their homes, EDUCATIONAL CHAIRMAN RAY GORAL introduced JOVITA REESE BARRETT of Stratford, Conn., wife of MEMBER R. BARRETT, as the main speaker. She is an expert on handwrought silver, having attended the Arts and Crafts Workshop at State Teachers' College, Willimantic, Conn., and being certified to teach the craft.

In her talk on "Silversmithing Is a Woman's Art, Too", she illustrated a variety of treatments, which require much skill and experience, and displayed some lovely silverware.

Refreshments were served through the courtesy of ROBERT CREAMER of the Hanson-Van Winkle-Munning Company, Matawan, N. J.

JOSEPH G. STERLING,
Secretary-Treasurer



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Controlled temperatures mean uniform, high quality plating, day in and out. You can control wash tank temperatures with the Sarco Thermoton at a cost of a few dollars. Most plating tanks can be controlled with the Sarco "LSI" electric control which costs much less than most methods. For special and highly accurate controls for vapor-line and heating and cooling there are a dozen different Sarco combinations. Four types of Sarco Steam Traps help reduce fuel costs.

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TANK TEMPERATURE CONTROLS

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BUFFALO BRANCH

The Branch at its January 6 meeting heard a fine talk on "Tumbling" by MR. N. R. DAVIDSON, President of the Sturgis Manufacturing & Plating Company, Sturgis, Mich. He presented the fundamental theories and recommended practices for tumble finishing. Having spent many years developing procedures for all types of metal, his knowledge of burnishing media, compounds, barrel design, etc., is boundless and he gave freely of his knowledge. Mr. Davidson's statements were borne out by his display of tumble-finished parts.

H. A. FUDEMAN, *Secretary*

CHICAGO BRANCH

At the January 4 meeting thirty members were present for dinner and the regular meeting. After routine business had been disposed of, the proposed By-Laws for the Chicago Branch were presented to the membership by the writer and were approved.

A color motion picture was shown through the courtesy of HARRY HANSON of E. I. duPont de Nemours & Company.

The Secretary announced the death of CHESTER MORGAN CAMPBELL, retired chemist and plating foreman of the Crane Company, who has been a member of the Chicago Branch for many years.

R. F. LEDFORD, *Correspondent*

CINCINNATI BRANCH

The regular December meeting, at The Engineering Society of Cincinnati's Building, opened with another delicious turkey dinner by our caterers, the Pinewood Food Shops. Having moved to the auditorium, the group was then treated to a fine color movie on fishing in Jasper Park waters. Following were an open discussion of several Branch matters and appointment of several committees. Perhaps the most important item was that of preparing a Branch Exhibit for the National Convention. It was decided that the

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January meeting will be given over to collection and arrangement of exhibit material which our members are to bring in.

Speaker of the evening was Mr. M. L. Moll of the Mine Safety Appliances Company, who spoke about safety and safe practices in and around the plating plant. Mr. Moll followed this with a very informative movie, supplied by his company, which further explained the use of their safety equipment.

The Branch was also honored to have as its guest Mr. William J. Neill, First Vice-President of the Society. Mr. Neill discussed the importance of gaining new sustaining members and active members and of the Branch Exhibits at the Convention. He also touched on the Toulmin Award, which is open to our Branch, and made suggestions pertaining to Branch By-Laws (which our Branch is considering).

After the meeting, refreshments were served through the courtesy of Harshaw Chemical Company.

H. R. Davis, *Secretary*

COLUMBUS BRANCH

The January meeting on the 6th, in Battelle Institute, had an attendance of about 75 per cent of the membership.

Mr. A. H. DuRose of the Electroplating Division of Harshaw Chemical Company, Cleveland, Ohio, was the speaker. His lecture on the "Perflow Process" was very interesting. Illustrated with slides, it showed the production of highly smooth deposits of excellent buffability.

Refreshments were served.

Walter Denny,
Second Vice-President

DAYTON BRANCH

At the regular meeting on January 9 it was decided on the basis of a recent survey, to change the meeting date to the first Friday of each month, effective in March.

The speaker was Mr. S. P. Jackson, General Electric Company, and the title of his lecture, "Rectifiers for Electroplating". Mr. Jackson's talk covered types and construction of rectifiers available today for the electroplating industry, advantages and disadvantages of each type, and comparisons with motor-generator sets. It was followed by a lengthy discussion which showed the interest in this topic.

Due to projector failure, the color film of rectifier manufacture at the General Electric Plant could not be shown. It will be available again at a later date.

On January 19 the members were treated to a fine steak dinner, followed by a plant tour, by the Moraine Products Division of General Motors Corporation.

The tour covered manufacture of many types of automoitve bearings, porous-metal filters, powdered-metal gears, bearings and hydramatic-transmission parts. Of particular interest was the plating section composed of automatic machines for plating zinc, cadmium, and tin.

That it was a very interesting and educational trip can be attested by any one of the sixty-one persons present.

R. M. Clinehens, *Secretary*

DETROIT BRANCH

The meeting on January 6, attended by approximately one hundred and fifty members and guests, was a joint meeting with the Detroit Section of The Electrochemical Society, the first to be held in a long time. Bernard Case spoke for the Electrochemical Society and acted as Technical Chairman for the evening.

As usual a large number of applicants, this time twelve, were elected to membership.

The technical paper of the evening was presented by Dr. Louis Weisberg, Consulting Chemist, New York City, who spoke on the subject of "Polarization and Related Phenomena". The major portion of Dr. Weisberg's paper was concerned with anode polarization.

A lively discussion followed, and even after the meeting had adjourned and while refreshments were being served Dr. Weisberg was kept busy answering questions on the subject.

F. J. Newton, *Librarian*

HAMILTON BRANCH

Mr. J. Guffie of United Chromium, Ltd., Toronto, Ontario addressed the January meeting, held in the West Plant Auditorium of Canadian Westinghouse, on a general subject of experiences in the plating field.

After a brief explanation of the merits of the new high-efficiency chromium plating solution put out by his company, Mr.

STANDS UP IN ALL CYCLES!

Outstanding rack protection achieved by plastisol Unichrome COATING 218X

No matter what you need in rack protective qualities, Coating 218X has it. Resistance to vapor degreasing? Coating 218X has that! Ability to stand up in hot cyanides or caustics? In chromium plating? Again 218X is the answer. And if it can withstand *those* plating operations, it will take them *all*.

In test runs at a well known plating plant, for example, Coating 218X was put through a cycle including soak cleaners, anodic alkaline cleaner, cyanide dip, acid dips, nickel plate, chromium plate and chromium strip. There was still no attack after *840 cycles*, at which time the attempt to break down Coating 218X was abandoned!

Physically, too, Coating 218X leads. It won't chip, resists cutting and abrasion, minimizes dragout. All in all, it's easy to see why your rack coating costs will hit bottom with Coating 218X. Write today for prices.

(NOTE: Applicators nearby can bake 218X onto your racks if you have no facilities for applying it. Ask for names.)

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Guffie in a very amusing manner commented philosophically on plating difficulties. If the plating supervisor shares his troubles with his men, they will do everything they can to come to his assistance and free him of his difficulties. Improvement in the quality of plating can be realized by the expenditure of a large sum of money, but the skillful trouble-shooter can often produce better quality products by a few changes at little or no cost.

Contaminated plating solutions, Mr. Guffie said, have contributed less to low quality of plated products than improper cleaning cycles. In most cases the rearrangement of a cleaning cycle with the addition of one or two clean rinses results in superior quality. He suggested that cleanliness was next to godliness also in the plating shop.

A very lively discussion period followed.

PRESIDENT W. YOUNG requested that nominations to the Executive for 1950-1951 be forwarded to the Secretary by February 17. The elections will be held at the March meeting, the installation of officers at the April meeting. Mr. Young reported that the membership had almost doubled in the past year and that we were progressing favorably for a new Branch.

G. M. DALTON, *Correspondent*

HARTFORD BRANCH

The meeting on January 16, attended by fifty members and guests, opened with a movie, "Safety", shown through the courtesy of the Eastman Kodak Company.

The guest speaker was MR. RUEL C. STRATTON, Supervising Chemical Engineer of the Travelers Insurance Company, whose subject was "Health and Safety Hazards in the Plating Industry." His talk is published in this issue.

KERMIT T. SIMONS acted as technical chairman, and refreshments were served through the courtesy of Apothecaries Hall, Inc.

STANLEY PLATOZ, *Secretary*

JACKSON-LANSING BRANCH

The fourth meeting of the 1949–1950 season was held on December 13 in Hotel Porter, Lansing, with an attendance of forty-eight.

MR. B. C. CASE of the Hanson-Van Winkle-Munning Company, our host for the evening, led the group in a very informative discussion on varied plating problems. His technical knowledge helped remove some of the members' daily plating troubles.

A movie, entitled "Lead Refining", was shown after the discussion period.

FRED W. STUCKENBERG,
Publicity Chairman

LANCASTER BRANCH

The annual Ladies' Night was combined with a Christmas Party held December 8 in the Moose Hall, Harrisburg, Pa. An excellent dinner was followed by a magic demonstration, bingo, and dancing. Numerous prizes were drawn, and a buffet luncheon was served at 10:30 P.M.

The efforts of the party committee headed by Charles Snyder resulted in an affair of which it might be said, "an enjoyable time was had by all".

CHESTER W. SMITH,
Secretary-Treasurer

LOS ANGELES BRANCH

The regular December meeting was held on the 14th with fifty-one members and guests in attendance.

LIBRARIAN MCDONALD introduced as the main speaker, MR. RICHARD WOOLEY of United Chromium, Inc., who spoke on "The New Unichrome Self-Regulating High-Speed Chromium Plating Bath". Mr. Wooley's talk was informative and well received. Interesting samples of plating done in the new bath were exhibited, and several slides were shown. A lively discussion followed.

The Librarian next introduced MR. A. P. JEANETTE, in charge of rehabilitation work at Los Angeles County's Rancho Los Amigos. He described the creative work being done there and explained the need for plating equipment to start up a small electroplating department where patients can learn the art of plating and produce articles for sale. Mr. Jeanette made a plea for the membership to take stock of idle equipment with a view towards making it available to the institution.

Mr. Wooley, in reporting on the status of the 1951 Convention plans, stated that an attendance of 1100 persons is antici-

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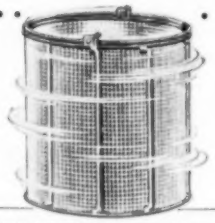


*Only 2 simple steps required . . .

(1) Operator places wire mesh basketful of small parts in Dryer . . . turns motor "ON."

(2) Operator turns motor "OFF" . . . presses foot brake . . . removes basket.

NEW HOLLAND *KREIDER* DRYER

pated and that a general program has been outlined.

M. H. Orbaugh, *Secretary*

LOUISVILLE BRANCH

At the December 15 meeting, Stanley Beyer reported for the committee appointed to investigate the possibility of a new meeting place. The committee, which included Herb Pate and Tom Allison, reported two to one in favor of retaining our present meeting time and place at the University. The members will vote on the question at the January meeting.

President Albert Steidle then introduced Mr. Frank Mesle of Oneida, Ltd., manufacturers of Community Plate, who discussed "Problems and Progress in Silver Plating". A brief summary of silver plating at Oneida was given first. Questions from the audience brought forth more details of tests and specifications. Then case histories of past problems were given in detail and, finally, a look into the future of silver plating. Many samples were shown which brought a flood of questions. The members, who for the first time were afforded the opportunity of questioning a noted authority on the subject, no doubt benefited greatly from this opportunity.

Stanley J. Beyer,
Secretary-Treasurer

MILWAUKEE BRANCH

The 406th meeting was held on January 6. Everett Robinson was appointed committee chairman to handle details of a party for the members.

Assistant Librarian Frank Bushner then introduced Mr. Leonard E. Weeg, Superintendent of Finishes, National Lock Company, Rockford, Ill., who gave an interesting and thorough report on the A. E. S. Research Program. Many questions and comments followed.

Two men were elected to membership.

Harry J. Krueger,
Secretary-Treasurer

NEWARK BRANCH

The combined Christmas Party and Educational Meeting was held on December 17 in the Robert Treat Hotel. Four hundred members and their guests assembled at the Banquet, while seventy-five people comprised the audience at the "paper" session.

Librarian Robert Ehrhardt introduced the three speakers and handled the discussions following each of the papers presented.

The first speaker was Mr. J. B. Winters, Research Chemist of the R. O. Hull Company, who with the aid of slides made a fine presentation of the Hull Winters paper, "Factors that Influence Operation of Chromium Plating Baths". (See 1949 *Proceedings*.)

Dr. Samuel Heiman, Chief Chemist of the Philadelphia Rust Proof Company, delivered his paper on "The Deposition of Immersion Metallic Coatings on Aluminum". (See "Article Abstracts" in the February issue.)

The third speaker was Mr. E. T. Candee of Lea Manufacturing Company whose paper dealt with the factors that are involved in the finishing of metal with abrasives. His presentation was clear and interesting. He gave practical suggestions on how some of the variables—the composition and properties of the metal to be polished and of the abrasives and binders used in the buffing stick; the type of wheel and its peripheral speed; and the pressure brought to bear on the work—may be controlled so that the finished surface may approach the desires of the operator or the requirements of the specification.

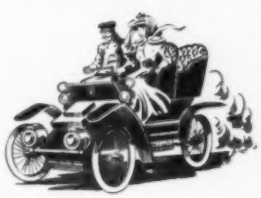
In the evening, a delicious turkey dinner with all the trimmings was served. Paul Oldam, one of our Branch members, acted as Master of Ceremonies and presented five acts of vaudeville which delighted the audience. Mr. Oliver managed to get the group to sing a number of popular songs. The dancing which followed continued into the early hours of the morning. This was one of the best parties in attendance and in program quality.

Samuel S. Frey, *Recording Secretary*

NEW HAVEN BRANCH

The October meeting was held on the 11th. Technical Chairman George Tracchio introduced Mr. R. N. Dwyer, Barnstead Still & Sterilizer Company of Boston, Mass., who spoke on "Purification of Water by Ion Exchange". Mr. Dwyer proved well qualified to speak on

YESTERDAY . . .



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this subject and gave interesting and informative data on impurity removal and purification wastes.

BERNARD J. GAFFNEY,
Secretary-Treasurer

NEW YORK BRANCH

Seventy-six members attended the meeting on December 9 to hear Mr. FRANK MESLE of Oneida, Ltd., Oneida, N. Y., discuss the "Problems and Progress of Silver Plating".

Several peculiar problems encountered by Mr. Mesle would qualify him as the "private eye" of the plating industry, for only good detective work led to their solution. When peeling of the silver plate occurred only at a certain time of the day, Sherlock Mesle traced the difficulty to the water softening process and, instead of frequent additions of softening chemicals in small amounts, administered one large dose at that particular time of the day. The case of the impurity in the copper wire used for stringing the work and the case of changes in polishing compounds abrasive, as innocent as they may seem, were other examples that showed that the plater's is a merry life with never a dull moment.

Mr. Mesle then went on to discuss brighteners, PR plating, agitation effects, and methods of control.

Refreshments were served.

ALBERT FUSCO, *Recording Secretary*

PITTSBURGH BRANCH

On January 12 there were twenty men present at the dinner and forty men, including four visiting members, at the meeting which followed. The Branch voted to give a sum of $125.00 to the Research Fund as its annual contribution.

The Chairman of the Ladies' Night Committee announced that his committee would consist of E. B. WASHBURN, L. J. SCHMITT, JR., R. E. GEUDER, A. F. KAUPE, G. HERRING and R. A. WOOFTER. A Nominating Committee was appointed by PRESIDENT L. J. SCHMITT as follows: W. J. HENNESSY, E. B. WASHBURN and K. K. CARPENTER. Three men were elected to membership and four applications for membership were accepted.

MR. CLIFFORD STRUYK of the General Chemical Division of Allied Chemical & Dye Corporation then gave a talk on "Fluoborate Plating Solutions". Mr. Struyk, who is a recognized authority on these solutions, having conducted a tremendous amount of research and development work with them, also described use of fluoboric acid in metal pickling. A considerable number of questions were asked and answered by the speaker.

MR. S. S. JOHNSTON then gave a paper prepared by A. E. S. SECOND VICE-PRESIDENT C. F. NIXON, describing the Society and how it operates. The talk was illustrated and was warmly accepted by all present.

E. J. SMITH, *Secretary*

PHILADELPHIA BRANCH

A regular meeting was held in the Harrison Laboratory of the University of Pennsylvania on January 27 with forty-five members and guests present.

LIBRARIAN HIRSCH introduced MR. FRANK MESLE of Oneida, Ltd., who spoke about "Problems and Progress in Silver Plating". Mr. Mesle presented typical problems encountered in production plating and showed how in quite a few cases the causes were factors over which the plating department had no immediate control. He stressed the importance of adhering to standard procedures in order to obtain uniform results. The plating cycle for silver plated ware was tripoli buff, emulsion clean, alkaline electroclean, white nickel plate, silver strike, and silver plate, interspersed with the necessary rinses, acid and cyanide dips. A proper silver strike was of the utmost importance to insure adhesion of the silver plating to the nickel. Brighteners allow a considerable increase in current density, the carbon disulfide-cyanide type being used for decorative plating. The potassium silver bath is preferred over the sodium type. The free cyanide content of the plating solution should be high enough to give proper anode corrosion at the current density used, generally 2-3 oz/gal higher than the silver content. No brightener must be used in the silver electropolishing solution which is characterized by need for very accurate current density control.

The Research Committee film, "The Wife of Lot", was then shown. The door prize, a bottle of "brightener" donated

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by Hanson-Van Winkle-Munning Company through Thomas M. Rodgers, was won by Robert Graham.

I. Wm. Marcovitch,
Secretary

ROCHESTER BRANCH

Not less than one hundred and twelve members, wives, and guests attended the annual Christmas Party on December 10 in Avery's Restaurant. All enjoyed a fine turkey dinner, after which the grab prizes were passed out and the door prizes drawn by ticket stub. The generosity of the supply houses enabled nearly one-third of those attending to participate in the drawing. Round and square dancing completed the evening's entertainment.

All enjoyed themselves immensely and look forward to a repetition of the event, come next Yuletide. The party committee was headed by Ray Berghold, who was given a rising vote of thanks at the party for a job exceedingly well done, right down to the last detail. Assisting him as a ticket committee were Paul Pasnak, James Weaver, and Robert Flint.

Gordon W. MacDonald,
Secretary

SAGINAW VALLEY BRANCH

Approximately sixty members and guests attended the January 11 dinner meeting at Zelnder's Hotel in Frankenmuth, Mich.

Joe Farmer, Chairman of the Party Committee, reported plans for the "Ladies' Night" party on February 8. John Jacks, Chairman of the Research Finance Committee, gave a report on the sustaining-membership drive. The door prize, donated by James Dunn of United Chromium, Inc., was won by W. E. Remington of AC Spark Plug, Flint, Mich.

Manuel Ben introduced the guest speaker, Mr. W. M. Phillips, Head of the Electrochemistry Department of General Motors Research Division, who gave a very interesting talk entitled "Some Characteristics of Electrodeposits".

Two colored movie cartoons were shown.

John W. Lee,
Recording Secretary

SPRINGFIELD BRANCH

The first meeting of the season on September 26 in Hotel Charles had an attendance of about fifty.

After a short business meeting and an enjoyable film, "Sports Highlights", presented by President Larry Fountain, the group heard a very interesting lecture by Mr. Howard A. Boyer, Chief Metallurgist, American Bosch Corporation, Springfield. Discussing "Characteristics of Base Metals and Their Relation to Electroplating", he pointed out that base metals must be activated for receptiveness to deposition and that they vary in ease of chemical activation. As a rule, the lesser the corrosion resistance of a metal, the better its receptiveness. Brass is an exception in that it is readily activated. As the refinement of steel increases, the difficulty of plating it increases. Metallurgists believe that cathodically desposited hydrogen is absorbed in grain boundaries and forces the grain structure apart. Heating helps but is not the ultimate answer to hydrogen removal. Of all common metals steel is the most susceptible to hydrogen embrittlement, especially when in the spring-temper range or harder (below Rockwell 40 steel is ductile).

After a brief question and answer period, refreshments were served through the courtesy of Jack Costigan, Hampden Color and Chemical Company.

James Laing, *Secretary-Treasurer*

SPRINGFIELD BRANCH

At the October 24 meeting, Mr. Harry Sanders of Enthone, Inc., New Haven, Conn., presented a talk, "What Makes for Success in the Plating Room". His first item was rinsing. Suggesting that the plater develop real interest in water usage he recommended the use of syphon breakers and of control of spray rinsing by means of spring-activated valves. Under item 2, cleaning, he endorsed the use of the current densities recommended by cleaner manufacturers and controlling them by means of meters. The tank should not be used as an electrode. Item 3, cleanliness in the shop, is taken care of by good housekeeping, including cleaning of contacts and circuits. Under item 4, Mr. Sanders criticised the lack of cooperation which often exists between technical men and platers, the latter feel-

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ing insecure because the technical men may know more about plating procedures and solutions. As item 5, he therefore recommended that platers become better managers and make better use of published information so that they know what they are doing and why.

JAMES LAING, *Secretary-Treasurer*

SYRACUSE BRANCH

The entertainment at the meeting on January 16 was a travel film, "Meet North Carolina", shown through the courtesy of The Esso Standard Company.

The speaker of the evening was MR. J. W. MCCRACKIN, District Manager of The Mine Safety Appliances Company. His topic, "Respiratory Hazards in the Plating Industry", was very interesting and enlightening. A sound movie, "The Air We Breathe", constituted part of his presentation, along with a display of safety appliances.

The attendance was twenty-four.

K. S. PARNELL, *Secretary-Treasurer*

TOLEDO BRANCH

The Christmas Party on December 1 began with a short business meeting at which one membership application was accepted.

MR. W. J. NEILL, A. E. S. First Vice-President, reported on what the Society is doing and trying to do. He very capably explained why things are being done or are not being done that were not understood by some of the members. His answers to questions were direct, sincere, and convincing, and he won the respect and good will of all.

Names were drawn for prizes and everyone present received a prize, MR. TRIPLETT of Bluffton, Ohio winning a 15-pound turkey. After this there were eats, drinks, card games, etc.

G. P. H. BERGEMAN, *Secretary*

TOLEDO BRANCH

The regular monthly meeting on January 5 in the Commodore Perry Hotel began with a short business meeting after which MR. GOMMERSOL introduced the speaker of the evening, MR. R. H. DUDLEY of United Chromium, Inc. During his very interesting presentation of the Unichrome self-regulating high-speed chromium plating bath, he showed samples plated in the new bath which were considerably superior to the same parts plated in the old bath in respect to bright plate in recesses.

G. P. H. BERGEMAN, *Secretary*

TWIN CITY BRANCH

There were thirty-four persons present at the meeting on December 5.

Following dinner and a short business meeting, FIRST VICE-PRESIDENT AL JOYNER introduced guests present and turned the meeting over to BRANCH LIBRARIAN GUNNAR DEEDON, who introduced the speaker, MR. NESS of Behr-Manning. The latter gave an interesting talk on methods of polishing metals with abrasive belts and was presented with a token of appreciation from the Branch for his contribution.

ROBERT L. BUCKLEY, *Secretary-Treasurer*

TWIN CITY BRANCH

A new feature was introduced at the meeting in January in which all members were expected to take part.

LIBRARIAN GUNNAR DEEDON had arranged a program in which a Board of five members would attempt to answer any question submitted to it by the other members. The members serving on the Board were JEROME WELLER of Brown and Bigelow, Inc., A. T. LEONARD of Superior Plating and Rustproofing Company, ARTHUR M. CARLSON of Arlington Machine Works, Inc., and ROBERT L.

PLATO
— O.K. LOVER BOY! UP AND AT 'EM! — TO THE URANIUM PITS! YOU'RE LATE!
— SO FOR THREE MONTHS YOU RODE THIS LINE AND NEVER SAW A CONDUCTOR! PAY UP OR —
— IF THE 'OLD MAN' SPOTS HIM — YOU'LL SEE PLATO COVERING MORE GROUND —!
DOSTALE

Buckley of Industrial Chemical and Equipment Company. Questions answered by the Board related to sulfate removal from chromium solutions, cleaning of zinc-base diecastings, linings for chromium plating tanks, effects of a passive surface, and many others.

The meeting proved to be one of the most interesting ever conducted by the Branch, and similar programs will be arranged in the future.

The attendance was thirty-seven.

Robert L. Buckley,
Secretary-Treasurer

WATERBURY BRANCH

The meeting on December 9 took the form of a metal-finishing forum with five speakers, each briefly reviewing a separate phase of metal finishing.

Henry Strow in his discussion of modern methods of electroplating treated the increased popularity of the small fullautomatic plating machine and the trend toward completing the entire plating cycle in one machine. With new construction materials available, fullautomatic and semiautomatic barrel plating is becoming more prominent, with entire cycles being completed in the same barrel.

Dr. H. L. Kellner presented methods for evaluating polished surfaces by means of the profilometer, the brush analyzer, and the replica method in which the scratch pattern is reproduced in a plastic sheet. The latter seems to be the simplest of the three, producing permanent visual records which can be readily compared.

Theodore Voyda reviewed cleaning materials and procedures. The practical criterion for a clean surface is whether it furnishes a surface which satisfactorily accepts the subsequent coating. Surfaces clean for painting and clean for plating would necessarily be quite different. Solvents, emulsion cleaners, and alkaline cleaners are rarely interchangeable but with increased complexity of the cleaning problems often complementary.

Meyer Shacat discussed advances in chromium plating. Almost any small part which tumbles freely can now be successfully barrel chromium plated with loads up to ten pounds, which means a production up to sixty pounds per hour from a unit. Accessories to plating, particularly rack coatings, have contributed a great deal to speed and efficiency and have made many modern plating methods possible.

Russell Pellington, enumerating the desirable characteristics of buffing compounds, pointed out that tripoli compounds are most generally used for cutting down. They must flow the metal to get a good finish, and to do this the compound must hold to the wheel until the work is done. The residue must wash readily from the work in preparation for subsequent operations. Cheaper, harder abrasives do not usually add to the cut and do increase buff wear. It is important that compounds contain materials which properly lubricate the buff so that the fibers do not break, because wheel costs are a large item in the total cost of buffing.

We were happy to learn from Dr. George Dubpernell's book review, that the third edition of *Blum & Hogaboom* is now available. This book emphasizes the basic principles of electroplating and is especially valuable for those who are entering the field of metal finishing.

Emil Shaker briefly called attention to a new copper-tin alloy bath in which the metal is in the form of copper stannate and the plating is carried out with insoluble anodes. He also referred to a process for producing a phosphate coating in which a paste is painted or sprayed on the metal to be treated.

S. L. Henn, *Secretary*

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Membership Report of the A. E. S.

Elections

BOSTON BRANCH: Francis B. Clark, Wesley M. Hague, Jr.
CHICAGO BRANCH: Louis Fontana, W. D. Jeffries, H. Miller, E. B. Wild
CINCINNATI BRANCH: Clifford P. Barth, Richard K. Evans
CLEVELAND BRANCH: Jerrold J. Kelley, A. P. Puro
COLUMBUS BRANCH: L. E. Day, D. E. Evans, Jr., P. E. Friebis, H. W. Gibbons, J. F. Soderberg, G. C. Zang, P. C. Zang
DETROIT BRANCH: C. E. Baxter, C. J. Finerty, J. W. Finerty, J. E. Kasper, W. L. McCracken, H. J. McVey, R. S. Moore, J. P. Reilly, S. P. Sax, S. Sobson, M. H. Steinbrenner, W. R. Swift
HAMILTON BRANCH: W. E. Horne, W. E. McIntyre, C. R. MacLeod
HARTFORD BRANCH: F. A. Rowley
INDIANAPOLIS BRANCH: Paul E. Richardson, Leo R. VanSell
LANCASTER BRANCH: Carl A. Herbst, Marian B. Meyers
LOUISVILLE BRANCH: Gerhard H. Hillebrand, Jr.
MILWAUKEE BRANCH: R. Lee Hundley, Sylvester T. Stroinski
MONTREAL BRANCH: Chris Johntos' election in error
NEWARK BRANCH: Dodd S. Carr, Walter S. Haag, J. MacGregor Noyes
ST. JOSEPH VALLEY BRANCH: Craig Hambidge
ST. LOUIS BRANCH: Robert N. Beger, William C. George, Jenry Kraus
SAGINAW VALLEY BRANCH: Chester G. Borlet, Sherman W. Lees
SAN FRANCISCO BRANCH: Earl F. Beeman, H. J. Smith, D. L. Maviglia
SYRACUSE BRANCH: George P. Rubel
TORONTO BRANCH: J. H. Creswell, J. J. Galloway, M. R. Kirk, D. Mainland
WATERBURY BRANCH: Francis X. Bergin, Robert F. Schumann
MEMBERSHIP-AT-LARGE: George K. Burton, F. E. Lane

Reinstatements

BOSTON BRANCH: Bruce Melville, Napoleon Vigeant, Monte J. Zopatti, Arthur C. Pearson, Alfred T. Clarke
CLEVELAND BRANCH: Jerry Piskac
DAYTON BRANCH: L. E. Michael
PHILADELPHIA BRANCH: W. Gaddy
MEMBERSHIP-AT-LARGE: Bernard Workman

Transfers

Eric Sampson, Jr., to Buffalo Branch; E. H. Marsh from Montreal Branch; William Dunlop to Western-Ontario Branch; D. E. Paton to Western-Ontario Branch; E. T. Ferguson to Western-Ontario Branch; K. W. Farquhar to Western-Ontario Branch

Resignations

ST. LOUIS BRANCH: Harry G. Diller
TORONTO BRANCH: P. J. Cooper, William Thomson

Suspensions

CHICAGO BRANCH: Jack Curry's suspension in error
ST. LOUIS BRANCH: W. Hunning, G. Nagel, F. Schramm, C. Wagner
TORONTO BRANCH: A. Friedlander
MEMBERSHIP-AT-LARGE: C. C. Pearce

Death

CHICAGO BRANCH: C. M. Campbell

Membership Competition

BRANCH	Membership April 1, 1949*	New Members	Net Change in Membership	Per Cent Net Change
FIRST GROUP				
DETROIT	427	79	+64½	+15.1
NEW YORK	265	27	+17½	+ 6.6
HARTFORD	133	11	+ 5	+ 3.8
CLEVELAND	186	20	+ 5	+ 2.7
PITTSBURGH	135	22	+ 3½	+ 2.6
PHILADELPHIA	187	17	+ 3	+ 1.6
GRAND RAPIDS†	160	..	.....	.....
BRIDGEPORT	160	6	− 3½	− 2.2
LOS ANGELES	217	18	−11	− 5.1
CHICAGO	391	23	−22½	− 5.8
BOSTON	153	10	− 9	− 5.9
NEWARK	256	20	−17½	− 6.8
MILWAUKEE	132	11	−11	− 8.3
TORONTO	154	10	−16½	−10.7
SECOND GROUP				
MELBOURNE	81	24	+19	+23.4
CINCINNATI	90	9	+ 7½	+ 8.3
BUFFALO	82	6	+ 6½	+ 7.9
WATERBURY	122	7	+ 2½	+ 2.0
SYRACUSE	83	7	+ 1½	+ 1.9
SYDNEY†	108	8	+ 1	+ 0.9
INDIANAPOLIS	104	11	.....	.....
PROV.-ATTLEBORO	109	3	− ½	− 0.5
BALTIMORE-WASH.	83	7	− ½	− 0.6
NEW HAVEN	108	3	− 4½	− 4.2
DAYTON	98	3	− 5½	− 5.6
ST. LOUIS	107	14	−10	− 9.3
ROCHESTER	125	..	−20½	−16.4
ST. JOSEPH VALLEY	80	5	−14	−17.5
THIRD GROUP				
SOUTHEASTERN	38	16	+10½	+27.6
COLUMBUS	38	14	+ 9½	+25.0
LOUISVILLE	20	6	+ 4½	+22.5
ROCKFORD	56	8	+ 8	+14.3
LANCASTER	59	5	+ 4	+ 6.8
SPRINGFIELD	50	2	+ 2	+ 4.0
MONTREAL	69	10	− 2	− 2.9
SAGINAW VALLEY†	67	6	− 3	− 4.5
JACKSON-LANSING	59	3	− 3	− 5.1
TWIN CITY	77	4	− 8	−10.4
ADELAIDE	76	4	− 8	−10.5
SAN FRANCISCO	71	19	− 8	−11.3
TOLEDO	56	2	− 6½	−11.6
ALLENTOWN-READING	43	1	−10½	−24.4
OUTSIDE COMPETITION				
HAMILTON	....	17	23	.....
WESTERN ONTARIO	....	19	23	.....
AT LARGE	100	25	5	.....
IN TRANSFER	22	..	− 6	.....
TOTAL A. E. S.	5,237	540	+10	+ 0.2

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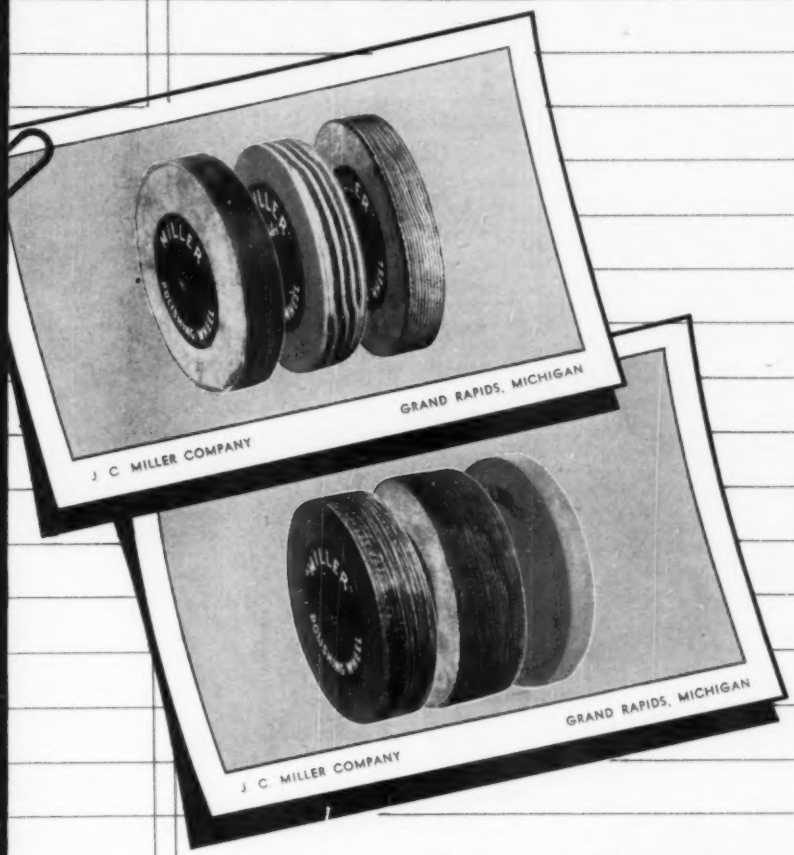

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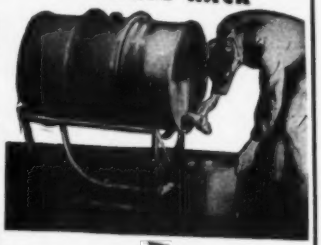

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THE ELECTROCHEMICAL SOCIETY, 97th Meeting in Statler Hotel, Cleveland, Ohio on April 19-22.

ELECTRODEPOSITORS' TECHNICAL SOCIETY Silver Jubilee and Annual Conference in Grand Hotel, Eastbourne, England on April 19-22.

NEW ENGLAND REGIONAL MEETING, A. E. S., sponsored by New Haven, Boston, Hartford, Springfield and Waterbury Branches in Hartford Club, Hartford, Conn., on May 6.

AMERICAN ELECTROPLATERS' SOCIETY 37th Annual Convention and the 4th International Conference on Electrodeposition in Statler Hotel, Boston, Mass., on June 12-15.

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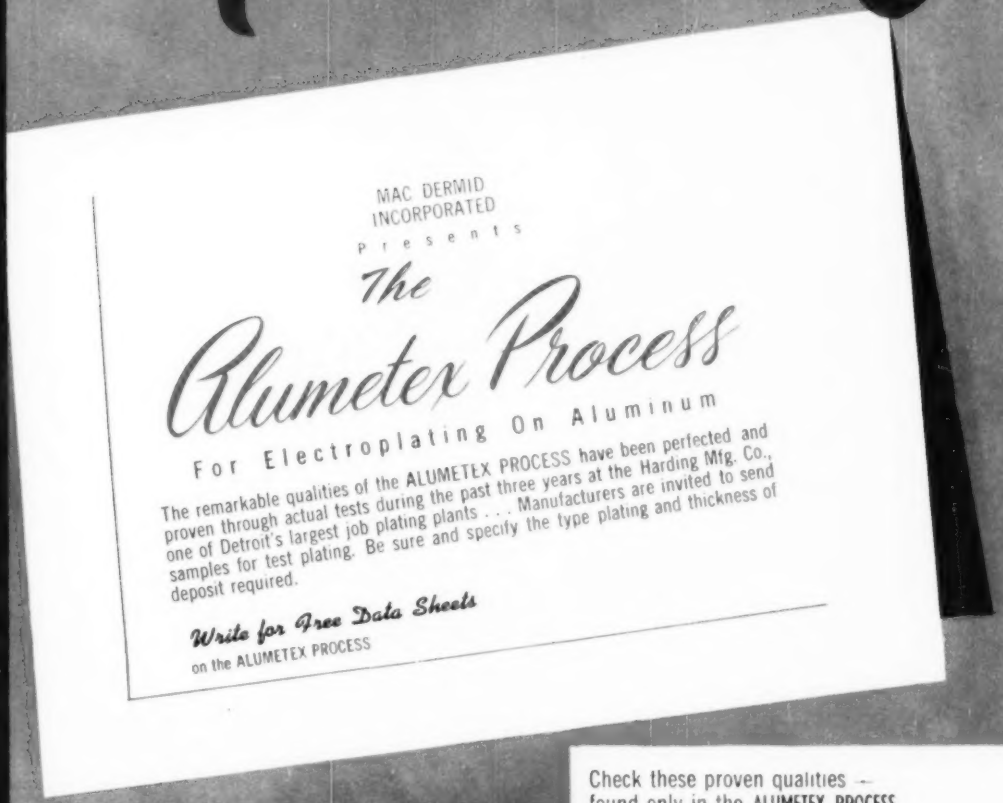
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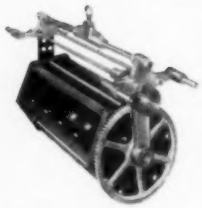

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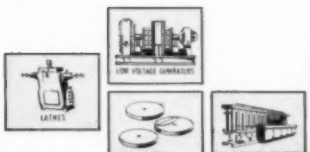

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